

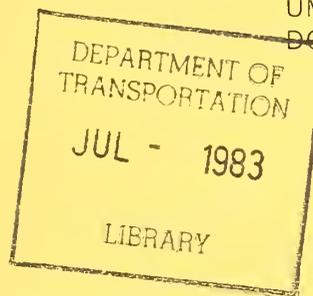
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U.S. Department  
of Transportation

**Urban Mass  
Transportation  
Administration**

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DOT-TSC-UMTA-83-11



# **Accessible Bus Service in Palm Beach County, Florida**

**Final Report  
March 1983**

**UMTA/TSC Project Evaluation Series  
Service and Management Demonstration Program**

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16. Abstract <p>The Palm Beach County Transportation Authority introduced accessible fixed-route service on its countywide CoTran bus service in May 1980. CoTran provided 100% (full-fleet) accessible service, using 23 retrofitted buses and 40 new buses, all equipped with front-door lifts manufactured by Transportation, Design and Technology.</p> <p>An UMTA Service and Management Demonstration grant funded purchase and installation of retrofit equipment, marketing, driver training and data collection for evaluation purposes. The Transportation Systems Center was responsible for this evaluation study, conducted by its evaluation contractor, Multisystems.</p> <p>This report covers the accessible service project implementation and operation through July 1981. Data was supplied by CoTran, including surveys of lift users and non-users conducted about one year after implementation.</p> <p>Among the key conclusions of the evaluation are that in areas where service frequencies are low, routes are widely spaced and there are curb barriers to wheelchair travel, lift ridership will be minimal. Despite the fact that Palm Beach County appeared at first to offer ideal conditions for a demonstration project of this type, characteristics of the area and the transit system combined with the lack of a close working relationship between the transit operator and the disabled community, made for a small lift ridership comprised primarily of individuals without other alternatives. Nevertheless, the project was successfully implemented and the lift was able to be used by those in standard size wheelchairs. The marketing programs were effective in at least informing the disabled public of the availability of service. Drivers and other riders reacted favorably for the most part, and there was no disruption of regular bus service. While operating costs were lower than in several other similar projects, the cost per trip was still quite high, \$56 per trip excluding capital costs.</p>					
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The report is based on analysis of data collected by CoTran (the Palm Beach County Transportation Authority) and its contractor, Regional Research Associates. The authors wish to express particular thanks to the following individuals for their assistance to the evaluation study:

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# METRIC CONVERSION FACTORS

## Approximate Conversions to Metric Measures

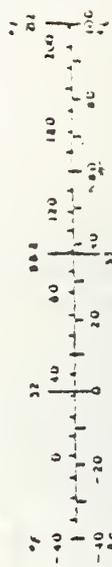
Symbol	When You Know	Multiply by	To Find	Symbol
<b>LENGTH</b>				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
<b>AREA</b>				
sq in	square inches	6.5	square centimeters	cm <sup>2</sup>
sq ft	square feet	0.09	square meters	m <sup>2</sup>
sq yd	square yards	0.8	square meters	m <sup>2</sup>
sq mi	square miles	2.6	square kilometers	km <sup>2</sup>
acres	acres	0.4	hectares	ha
<b>MASS (weight)</b>				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
<b>VOLUME</b>				
cup	teaspoons	5	milliliters	ml
1/2 cup	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cup	0.24	liters	l
pt	pint	0.47	liters	l
qt	quarts	0.96	liters	l
gal	gallons	3.8	liters	l
cu ft	cubic feet	0.03	cubic meters	m <sup>3</sup>
cu yd	cubic yards	0.76	cubic meters	m <sup>3</sup>

## TEMPERATURE (exact)

°F	Fahrenheit temperature	5/9 (then subtract 32)	Celsius temperature	°C
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## Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
<b>LENGTH</b>				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
km	kilometers	0.6	miles	mi
<b>AREA</b>				
cm <sup>2</sup>	square centimeters	0.16	square inches	in <sup>2</sup>
m <sup>2</sup>	square meters	1.2	square yards	yd <sup>2</sup>
km <sup>2</sup>	square kilometers	0.4	square miles	mi <sup>2</sup>
ha	hectares (10,000 m <sup>2</sup> )	2.6	acres	acres
<b>MASS (weight)</b>				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	short tons
<b>VOLUME</b>				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m <sup>3</sup>	cubic meters	35	cubic feet	ft <sup>3</sup>
m <sup>3</sup>	cubic meters	1.3	cubic yards	yd <sup>3</sup>
<b>TEMPERATURE (exact)</b>				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



\* Use 2.54 centimeters for the exact conversion and more detailed tables. See also this Pub. 104, Units of Weight and Measure, Para 17, 25, 30. Celsius to °F is 1.8.

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# EXECUTIVE SUMMARY

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## Introduction

The Palm Beach County Transportation Authority (PBCTA) introduced accessible fixed-route service on its countywide CoTran bus service in May 1980. Using 23 "New Look" General Motors transit buses retrofitted with TDT G-30 front-door lifts and clamp-type wheelchair securement devices, and 40 new Transportation Manufacturing Corporation Citycruiser buses with similar equipment installed during production, CoTran offered 100% (full-fleet) accessible service.

A \$689,000 UMTA Service and Methods Demonstration grant funded the purchase and installation costs of retrofit equipment, marketing costs, driver training costs and data collection for evaluation purposes. A separate UMTA capital grant funded the purchase of the new buses.

The Transportation Systems Center (TSC), which serves as the research branch of the U.S. DOT and is responsible for SMD demonstration evaluations, conducted this evaluation for UMTA, through its evaluation contractor, Multisystems. TSC has been monitoring the progress of several lift-bus projects sponsored on the local level, although only a few others have implemented accessible service on an entire fleet.

This report addresses the results of the full-fleet accessibility project in Palm Beach County from the beginning of the project until July 1981. Much of the project evaluation is based on surveys of 20 CoTran lift-users and 60 disabled non-users, conducted during May and June 1981, about one year after the entire system became accessible. In addition, Multisystems obtained operations data and surveys from bus drivers and able-bodied riders from CoTran.

## Project Setting

The environment in which the demonstration took place had an influence on project results and on the transferability of project conclusions. Several characteristics of Palm Beach County led to its selection as one of UMTA's demonstration test sites for full-fleet accessible service. These characteristics include: a flat, negotiable terrain; a warm climate; a small but growing transit operation; and, most significantly, a large elderly and retired population (since disabilities are more prevalent among the elderly). It is probably the proportion of senior citizens that makes the area most unique -- 30% of the county population is over 60 years of age and some municipalities are populated primarily by senior citizens. The above characteristics were expected to encourage lift ridership.

Another significant area characteristic is the lack of a low-cost door-to-door transportation service for general purpose trips by non-elderly handicapped people, a service offered in several large urban areas. Furthermore, few of the agency-sponsored transportation services have lift-equipped vehicles. Thus, a full-fleet accessible transit system could potentially have had a substantial impact on the mobility of some segments of the disabled population in Palm Beach County.

The transit operation's low cost characteristics and "open-shop" were also key factors influencing the degree of driver cooperation achieved and the low maintenance costs experienced. Finally, the timing of the demonstration coincident with other transit service changes influenced the results. CoTran introduced accessible service at the same time as a number of other major transit service changes which increased rider comfort (e.g., new vehicles, air conditioning) and convenience (e.g., route and schedule changes). This confounded before-after comparisons of ridership, operating cost, etc.

#### Project Planning, Implementation and Operations

The need for special transportation services was recognized locally early in the 1970's when the Florida Department of Health and Rehabilitative Services (HRS) instituted the Lift-Line pilot project, a service designed to transport elderly, disabled and other HRS clients to social service agency appointments. When this fixed-route (largely non-accessible) service was absorbed into the county transit routes in 1974, the need for lift-equipped transit vehicles was recognized by the transit authority. Thus in 1977, PBCTA applied for a federal demonstration grant to make its fleet accessible. The project encompassed four major activities: retrofitting existing vehicles, obtaining new buses, marketing the service and training staff.

With the exception of the training program, the local disabled and social service communities had little involvement in the project. The planning of service policies and the selection of equipment involved disabled representatives only minimally, a fact which led to discontent among the members of the Barrier Free Design Committee (BFDC), the only major activist organization of disabled people in the area. The Elderly and Handicapped Subcommittee of CoTran's Citizen's Advisory Board never really materialized as an effective medium for input from the BFDC or other disabled people. It is possible that the BFDC would have been a valuable resource in promoting ridership if better cooperation had developed.

Due to inadequate maintenance staff and facilities and a shortage of spare buses to release for retrofitting, the installation process moved slowly, spanning a 30-month period. Although the original demonstration design called for 30 vehicles to be retrofit supplemented by 15 new lift-equipped buses, it was later decided that some of the older vehicles were in need of replacement. As a result, only 23 vehicles were retrofit and 40 new buses were purchased (the system also expanded during this period).

Training of CoTran's drivers took place in the summer and fall of 1979. Each driver received two hours of technical/skills training and two hours of handicap awareness training. Experts from outside CoTran, including a TDT staff member and several representatives of local agencies which serve the disabled, assisted in the training efforts. Both drivers and the agency participants believed the awareness training was a valuable program.

Marketing was a major element of the demonstration and accounted for nearly 20% of the grant funding. CoTran's public relations and advertising contractor designed and implemented the marketing program. Among the marketing media utilized were television and radio public service announcements, news coverage, newspaper advertisements and insert brochures, direct mailings to human service agencies, newsletters, slide shows, billboards and field demonstrations of the equipment. Representatives of the disabled and social service agencies as well as regional planning and CoTran staff believed the marketing program was very effective in informing the public, particularly the disabled, about the service. This belief was confirmed by survey results.

CoTran made several decisions regarding operating policies at the beginning of the demonstration that impacted ridership and relations with the disabled, including the following: (1) only wheelchair users were permitted to use the lift; and (2) no wheelchair user would be allowed to ride if they could not use the securement device on the vehicle. These policies were changed during the demonstration to permit wider usage of the equipment.

### Equipment

The lift equipment utilized by CoTran was among the earliest generation lift devices for transit buses. (TDT has since redesigned its lift and considers the G-30 model a prototype design.) CoTran experienced several difficulties with the lift at the outset of the project. Two of the major problems were ramp edges that were difficult for wheelchairs to traverse and lifts drifting from the stowed position due to changing hydraulic pressure. Additional devices had to be purchased and installed to correct these problems; the lift drifting problem was never completely resolved. Other major problems experienced during the demonstration were electrical and switch malfunctions and, on the retrofitted buses, structural weakness caused by the lift installation.

Probably the most significant design flaw was the short lift platform which could not accommodate some power-drive chair users. This problem was a source of dissatisfaction among members of the BFDC and received widespread news coverage. In addition, the clamp-type wheelchair securement device which cannot be used by Amigo and power-chair users was criticized (although any wheelchair user who can secure themselves with the safety belt is now permitted on the vehicle).

The frequent malfunctions of the lifts experienced at the start of the project were reduced as the project progressed. For most of the project, CoTran experienced lift malfunctions at a rate of 0.3 per bus per month. Three of every four drivers responding to a survey viewed the lift equipment as reliable.

Breakdowns attributable to lift equipment problems on the road which generally resulted in "changing-up" the bus (making vehicle substitutions) occurred at a rate of 0.1 per bus per month. CoTran was able to reduce the frequency of road calls by using the radio to instruct drivers in how to operate the lift and by screening drivers as they pulled into the garage to make sure that they knew the operating procedures.

As a result of lift malfunctions, CoTran expended an average of 0.8 mechanic-hours per bus per month in lift repairs, repairing 20-25% of the fleet every month. The retrofitted buses consumed more than twice as much lift repair time as the new buses.

While the project was designed to have minimal effect on the staff requirements at CoTran, additional assistance was needed. A lift maintenance contractor was employed for more than half of the demonstration period; afterwards CoTran had to hire one additional mechanic to perform lift-related maintenance. Once CoTran took over the maintenance of the lifts, the frequency of preventive maintenance inspections was cut in half, at no apparent detriment to service reliability (at least in the short term).

### Supply of Service

Limited residential access and long headways meant that potential passengers frequently had to walk long distances and rely on schedules in planning their trips. Although lift service has been reliable (experiencing a low denial rate), the low frequency of service on most routes makes denials, when they do occur, serious problems for users. In fact, service frequency at CoTran is not that different from that at other sites where only partially accessible service was offered. Major problems users have with the lift bus service involve getting to the bus in bad weather, the lack of shelters (several were still to be installed at the end of the demonstration), the barriers posed by curbs and busy streets, and denial of service due to inoperable lifts. Denials appear to have been more common according to lift users than reported by CoTran. During the three-month period before the survey, six of the 20 lift-users surveyed reported being denied service, only half of whom remained to wait for another bus.

Disabled people who use wheelchairs, walkers and/or braces were identified for a survey of users and non-users. Additional users were identified by CoTran. It was found that users lived substantially closer to a bus stop. Non-users cited "more and better located" stops as a major needed service improvement, pointing to the problem of access particularly in a transit network of moderate density.

Both user and non-user groups expressed considerable safety concerns relating to the need to cross major streets to reach the bus stop. Also posing a significant barrier to both users and non-users was the lack of curb cuts in many locations, an environmental feature not directly under CoTran's control.

Safety and security when using the lift and traveling by bus were not major issues among either users or non-users, and few accidents directly attributable to the lift have been reported. Accidents have typically involved ambulatory passengers tripping on the front steps. There is some question as to whether these accidents represent an increase over pre-demonstration levels; the lift is probably partially responsible, if there was an increase, since its installation increased the height of the first step.

Finally, the level of service for other (able-bodied) passengers has not been substantially impacted by the operation of accessible service. Although almost three-quarters of passengers were aware of the lift, half had never seen the lift in operation. Those that had seen someone use the lift did not perceive lift-use to cause inconvenient delays in service, and most had a positive attitude towards the lift service concept in general. However, a sampling of driver-reported dwell times indicates that with a higher level of lift-user ridership, service reliability (schedule adherence) could become a problem.

## Ridership

During May 1980, when service on all routes was implemented in the midst of an intensive marketing program (much of which related to other system changes), 18 boardings were recorded. Ridership grew in stages as the project progressed, reaching a peak of 151 by the following March (1981). The timing of the initiation of full accessible service in May may have contributed to the slow growth rate. CoTran ridership typically peaks in February or March and falls in the late spring and summer as winter residents return north. As a result, a drop in lift usage was noted in the late spring of 1981. It is important to note that the lift-user surveys and travel diaries indicated that there were several passengers whose trips were not recorded on driver logs; thus, some undercounting of lift usage is evident.

Initially, CoTran only permitted lift-use by persons in wheelchairs. By September 1980 the policy had changed to allow ambulatory (non-wheelchair) passengers to use the lift, since CoTran buses have no kneeling feature to otherwise assist those with difficulty boarding via the front steps. However, it appears that this policy change was never advertised to the public. As a result, there may be a number of potential lift users who have not tried the lift because they do not use wheelchairs. March 1981 figures show 16 boardings by ambulatory disabled or just over 10% of lift-trips. However, ridership reports for the succeeding four months show no lift usage by ambulatory passengers -- a surprising result, if accurate. Only four to five individuals were apparently responsible for these trips. Since the winter season draws to a close in April, and since their disability may have been of a temporary nature, it is entirely possible that these riders either no longer needed to use the bus or the lift.

The peak lift ridership of 151 per month recorded in March 1981 represents a mere 0.04% of total trips and 3.4% of handicapped transit trips (made by those presenting handicapped I.D. cards). Over the course of the project both lift-user and non-lift handicapped ridership has grown. In early 1981, handicapped ridership represented just over 1.1% of all riders. While lift ridership grew to three times the amount in the period from June 1980 to 1981, total handicapped ridership grew over ten times. The extensive marketing activities oriented to the elderly and handicapped funded as part of the demonstration may have made a major contribution to increased ridership among the handicapped, even among those who do not need the lift. Of course, actual improvements to the service, particularly in the area of vehicle comfort, may have greatly enhanced the usability of the service by handicapped people who may be very sensitive to ride quality, seating comfort, and temperature control.

Most of the lift users have experienced increased mobility as a result of the service: 69% reported traveling more often and 50% travelling "very much" to new places and activities as a result of the lift bus. Lift-users rated the lift-bus service quality as "good" to "very good" and 95% of them indicated they would use the service again. When asked whether they would prefer a door-to-door service, the respondent group was split.

## Travel Behavior

Surveyed lift-users and (disabled) non-users were found to be quite similar in many respects, such as sex, residential location, occupational status, use of aids, functional difficulties and affiliation with agencies. However, surveyed non-users are wealthier, have greater access to automobiles and make

greater use of personal lift-vans and special car controls, suggesting greater travel independence and less need or desire to use lift-equipped public transportation.

Generally, lift-users appear significantly more transportation disadvantaged, having fewer options available to them -- 40% are reportedly unable to make their lift-trips by other means and only 25% have a car available that they can drive. The average user made almost one-third of his/her trips on CoTran. Lift users in Palm Beach County thus bear a greater resemblance to the typical elderly or handicapped transit dependent individual than do the surveyed non-users. However, indications are that the non-user survey sample may not have been truly representative of the non-user population; as a result we cannot conclusively state that the lift bus is serving the most transportation disadvantaged segments of the local population, i.e., there may be many other transportation disadvantaged non-users who were not surveyed.

Lift-users learned about the service primarily from television and newspapers. Various influences encouraged users to try the service; none stood out as the most effective. Demonstrations of the lift-bus, which reached 45% of the users and 14% of the non-users surveyed, did not appear to be the most influential factor for any of the users, although they generally rated such training as very helpful.

Non-users were quite aware of the lift service, learning about it from television and newspapers, as well as by word of mouth. Only 13% believe they are able to travel by non-lift buses and 95% said they would use the lift if travelling by bus. As many as 90% feel they are physically able to use the lift-bus, although about half thought they would need some instruction in how to use it. Half of the non-users indicated that they plan to try the lift bus in the future.

With higher incomes than the surveyed lift-users and greater access to automobile-based travel modes, the non-users surveyed apparently prefer alternatives to lift-bus service. Clearly, CoTran service, which is provided at a relatively low frequency on most routes and has only limited service in residential areas, is much less convenient than many other alternative modes. However, environmental factors affecting bus stop access also appear to have played a significant role in discouraging lift use among a considerable portion of the surveyed non-user group. Non-users expressed great concern with the lack of curb cuts and sidewalks and with rough street surfaces, as well as the need to cross major streets to reach a bus stop. While these factors are also of concern to lift-users, the proximity of a bus stop to their residence appears to have been a significant factor in the decision of some users to try the service. More convenient bus stop locations (only 10% of non-users live within one block of a stop compared to 50% of users) would apparently encourage a considerable number of non-users to try the service as well. Unfortunately, it may not be feasible to remedy this problem.

#### Project Costs

While the accessible bus project did not have significant effects on schedules or drivers, it appears to have been quite costly for the operator. The low level of utilization has been a factor in minimizing the former impacts but has kept per-trip costs high. If we assume a 10% turnover of drivers and a ten year life for the lift equipment, the cost of lift service

on an annual basis (in 1981 dollars) totals \$238,572, of which \$151,763 represents capital costs amortized over 10 years. On a per bus basis, this cost amounts to \$3,787. It results in a cost per lift trip of \$153 including capital costs and \$56 including only operating costs.

One can only speculate what the impacts of greater lift utilization might be for the operator. It is noteworthy that for per-trip costs to be reduced to levels consistent with demand-responsive transportation (i.e., about \$12), ridership would have to increase more than ten-fold.

### Conclusions

- Palm Beach County appeared to offer ideal conditions for a demonstration project of this type, namely a large elderly population concentrated in several communities and developments, flat easily negotiable terrain, new low-rise (possibly more accessible) construction and good weather. Nevertheless, several local factors inhibited the growth of ridership. These include a "sprawl" development pattern with a corresponding automobile-dependent transportation system, lack of a dense transit network, lack of a regional curb-cut program, and the lack of a close working relationship between the transit operator and the disabled community.
- Lift ridership was limited by inconveniences associated with using CoTran, i.e., long headways and long distances to the bus stops. Lack of curb cuts or sidewalks and difficulty crossing major arterials created additional barriers for the disabled target market. The local disabled community and local human service agency staff generally expressed skepticism of the concept of fixed-route service without greater flexibility in bus stop location or feeder service. However, lift-users did not experience significant difficulties in boarding or riding the bus, and non-users generally indicated a belief that they would be physically capable of using the lift.
- Those that did use the lift were "captive" riders (i.e., those without other alternatives) typical of transit ridership in low density urban areas like greater West Palm Beach. These riders were often quite dependent on the bus, indicating that the service had a major impact on their mobility. A survey of disabled non-users suggested that they are generally wealthier, have more travel alternatives available and live farther away from bus stops. In many other respects, the two groups appear to be similar. However, the non-user survey sample was small and apparently not adequately representative of the disabled population; thus it is difficult to determine whether there really are significant differences that distinguish users from non-users.
- CoTran's extensive marketing program appears to have made nearly everyone aware of the accessible service. It is difficult to assess whether a smaller marketing effort could have achieved this awareness level or whether additional types of outreach might have generated a greater ridership.

- The use of "early generation" lift equipment created some problems for lift maintenance and contributed to dissatisfaction in the local disabled community. At issue was the short platform length which makes use of the lift by power-drive chairs difficult. Despite some of the equipment problems experienced, CoTran was able to maintain the lifts at reasonable cost levels. A major factor here is CoTran's lower hourly costs. Furthermore, CoTran did not require a very large spare ratio to insure that service was provided as advertised. While maintenance costs were reasonable, ridership failed to develop sufficiently to reduce per-trip costs of equipment purchase to "reasonable" levels. The total cost per trip was about \$150 (in 1981 dollars), of which almost \$100 represents capital costs amortized over a ten-year period.
- The driver reaction to the lift was good. Drivers characterized the lift as reliable and seemed to believe it was helping to improve CoTran's image. Management believed that the training program had helped to overcome initial fears or concerns on the part of of the drivers. Agency participants in the awareness training also believed the drivers were cooperative and interested in helping the disabled.

Due to the low frequency of service, typically long walk distances to the bus stop, and a lift platform too short for many wheelchairs, this demonstration has not provided us with definitive results on the potential for system-wide lift-equipped bus service in a dense urban area with a high level of transit service. However, it does suggest that without an accessible environment (e.g., regional curb-cut program), ridership potential may be limited, particularly in low density areas where service frequencies are low and routes are widely spaced.

# 1: PROJECT BACKGROUND AND OBJECTIVES

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## 1.1 DEMONSTRATION OVERVIEW

### 1.1.1 Description of the Demonstration

The Palm Beach County Transportation Authority (PBCTA) implemented a fixed-route accessible bus demonstration under an UMTA Service and Methods Demonstration (SMD) Grant (FL-06-0015). Through the purchase of new small buses and the retrofitting of existing larger buses, PBCTA achieved a 100% accessible fleet of 63 buses on the countywide public bus service, CoTran. Special equipment included both TDT front-door hydraulic lifts and wheelchair tie-down devices. As part of its new service to the disabled, CoTran issued half-fare cards for handicapped users, and carried out special driver training and marketing programs.

Funding for the demonstration totaled \$689,000, of which \$347,293 was for capital expenditures (to retrofit buses with lifts, folding seats with tiedown arrangements, and other amenities), and \$341,707 for operating expenditures (installation and modification, marketing, administration and management). See Table 1.1. These costs were 100% federally funded. This budget did not include the cost of 40 new transit buses with lifts and other amenities purchased during the demonstration period. Their purchase was funded by a separate UMTA capital grant of \$3.1 million (80% federally funded, 10% state funded, and 10% county funded).

Every CoTran bus in regular route operation offers service to the handicapped. The Palm Beach County demonstration was the first of a totally (e.g., 100%) accessible bus fleet, although a similar demonstration project was currently underway in Champaign-Urbana, Illinois.\* Palm Beach County provided a somewhat unique environment for testing the concept of fixed-route accessible bus service. Palm Beach County offers a climate in which travel is less constrained for handicapped persons (as well as others) during the winter, as well as a flat, easily negotiable terrain. The County has a uniquely high proportion of senior citizens and, although it is basically an area of dispersed development, it contains some major concentrations of residential apartments and condominiums, many catering exclusively to the retired community. Thus, in many respects, Palm Beach County presented some ideal conditions

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\* Connecticut Transit achieved nearly 100% accessible service in Stamford, New Haven, and Hartford several months earlier.

Table 1.1

PROJECT BUDGET  
 DEMONSTRATION GRANT PROJECT NO. FL-06-0015  
 PALM BEACH COUNTY, FLORIDA

Line Item	Budget Amount
Direct Labor	\$ 54,697
Materials and Equipment	347,293
Installation - lifts, seats, accumulators, sensitive edge	107,010
Information, marketing, training	140,000
Subcontract - Survey and data collection	40,000
Contingency	<u>0</u>
TOTAL	\$689,000

for this type of project and offered a valuable opportunity for evaluating the potential of the service concept.

Among the most important issues that the demonstration addressed are:

- the impact of fully accessible fixed-route transit on the mobility and lifestyles of the elderly and handicapped; and
- the impact of the lift equipment and their use on the service provided to current transit users.

1.1.2 Demonstration Objectives

PBCTA indicated two primary objectives for the demonstration project. One was simply to serve as the experimental site in the UMTA evaluation of the fixed-route service concept, hoping to provide information and operating experience for other localities interested in the service concept.

The second objective was user-related. The aim of the project was to serve handicapped people with the fixed-route system, complementing existing social service agency transportation services. In this way, CoTran could provide better services to county residents and facilitate the delivery of social services to handicapped persons. For this same reason, PBCTA also provides special services and reduced fare passes to clients of the State's Department of Health and Rehabilitation Services (HRS) under contract to that agency (independently of the UMTA-sponsored demonstration).

One of the five SMD program objectives\* was a primary focus of the Palm Beach County demonstration project: improve the mobility of the transit dependent. Because handicapped people are often either unable to obtain drivers' licenses, unable to drive standard vehicles, or unable to purchase a specially equipped automobile, many are transportation-disadvantaged. Unfortunately, in the past, they have been further disadvantaged due to the inaccessibility of transit vehicles and services. Thus, this demonstration attempted to increase the mobility of handicapped persons by equipping vehicles with lifts to enable handicapped persons, particularly wheelchair users, to board transit vehicles in regular fixed-route service.

In some cases, there was a possibility of a negative impact on other SMD objectives. For example, the time required to operate the lift for wheelchair passengers could have increased travel time for other passengers. Furthermore, productivity could have been adversely affected by delays and the removal of six seats on the older buses in order to accommodate wheelchairs. This evaluation has therefore addressed not only how the project meets the mobility needs of the transit dependent but also the impacts on other SMD objectives.

### 1.1.3 Background and Rationale for Selecting the Service Concept

The concept of installing lifts on the regular fixed-route buses in Palm Beach County in order to serve the handicapped was initiated by the Citizens' Transportation Advisory Board, a group of appointed representatives who make recommendations to the Transportation Committee of the Board of County Commissioners. The transportation problems of the handicapped had been recognized by HRS and local governments. It was in response to these perceived needs that:

- a. the City of Boca Raton petitioned the County to purchase small vehicles with lifts and lower floor heights; and
- b. the HRS Lift Line service was introduced as a pilot project in 1972 to transport clients to social services.

At the end of the two-year Lift Line experiment, Lift Line routes were merged with the regular route system, since most users were served well by Lift Line's fixed routes, and it was expected that these users could be served by the general transit system. This left many handicapped users without transit service, however. In reviewing 16(b)2 applications, the PBCTA decided it would be best for social service agencies to continue to provide special services for their clients (usually doorstep services which provide special assistance to less independent individuals). Therefore, to provide for the remainder of the handicapped population, the lift-equipped fixed-route service concept was proposed.

Before the demonstration began, wheelchair lifts of a slightly different type were operating on PBCTA's service in Boca Raton which was provided with six small buses. Although these buses provided both local fixed-route and dial-a-ride service, the lift option was utilized almost exclusively during the dial-a-ride period. The installation of the new lifts on major county fixed-routes was therefore a major innovation for the PBCTA. Coincidentally, dial-a-ride service was discontinued before the demonstration began.

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\* The others are decrease transit travel time, increase transit reliability, increase transit coverage, and increase transit vehicle productivity.

## 1.2 NATIONAL PERSPECTIVE\*

### 1.2.1 Legislation and Regulations

Although PBCTA's accessible bus demonstration was planned before the U.S. DOT issued its Section 504 regulations on accessibility, the project is a product of a movement to provide accessible transit service that began in the late 1960's. This movement toward accessible transportation systems and facilities may be viewed as an outgrowth of the movement for the civil rights of minorities, which made great strides in the 1960's. The 1964 Urban Mass Transportation Act and subsequent amendments recognized the need to address the rights of disabled people. In 1970, Section 16 was added to the Act, specifically declaring that "elderly and handicapped persons have the same right as other persons to utilize mass transportation" and requiring that "special efforts shall be made in the planning and design" to assure availability of services they can "effectively utilize."\*\*

The net result was to provide a general legislative mandate for planning and providing accessible transportation; however, the implementation and administration of this mandate based on executive regulations became somewhat controversial and subject to litigation. The most public part of this controversy has been a debate between "accessibility," meaning physical access to all modes whether or not they can be used, and "mobility," meaning adequate transportation regardless of its source. Typically, accessible fixed-route transit exemplifies "accessibility" and special demand-responsive systems for the elderly and handicapped exemplify "mobility."

The most powerful overall legislative influence on transportation for the elderly and handicapped has probably been the Rehabilitation Act of 1973,\*\*\* Section 504 of which provides that:

....No otherwise qualified handicapped individual in the United States, as defined in Section 706(6) of this title, shall solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal assistance....

In June 1978, the Department of Transportation proposed its regulations to implement Section 504; hearings were held to obtain comments from the public, interested consumer groups, and the transit industry. In May 1979, its final rules pertaining to Section 504 were issued. The rules outlined changes to be achieved and a timetable for compliance. In general, accessible public transit was mandated as the legally required long-term solution

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\* Portions derived from Applied Resource Integration, Ltd., Evaluation Plan for Bi-State Development Agency, (St. Louis) Accessible Bus Project, prepared for U.S. Department of Transportation, Transportation Systems Center, January 1978 and American Public Transit Association, Elderly and Handicapped Public Transportation: A Status Report, January 1977.

\*\* Public Law 91-453.

\*\*\* Public Law 93-112.

to urban public transportation for handicapped individuals. In particular, DOT's rules required the following for any federally funded bus system:\*

- All public transit buses purchased after July 2, 1979, must be accessible to handicapped persons, including wheelchair users.
- Fixed route bus systems should achieve program accessibility as soon as practical, but no later than three years from the date of the regulation.
  - Half of the peak hour bus fleet must be accessible within ten years.
  - Accessible vehicles must be used before those which are non-accessible in off-peak hours.
- Accessible connector service must be provided between accessible and non-accessible rapid rail stations.
- Where service cannot be made accessible within three years, some form of interim accessible service (such as retrofitting lifts to old buses, or supplying some form of temporary taxi service) must be offered.
  - The interim service must be comparable to the fixed-route services (to the extent feasible) in such characteristics as wait and travel time, area served, fare, trip restrictions, etc.
  - At least 2% of Section 5 funds must be expended on interim service.

The regulations also permitted operators of existing rapid rail systems to provide handicapped persons with some form of bus or taxi service instead of adapting the rail system, if local handicapped persons and DOT agreed to the alternative plan. At least 5% of Section 5 funds had to be used for such alternative service.

The DOT rules for implementing Section 504 guaranteed handicapped persons their civil rights with respect to the use of public transit systems, but the barriers which still remained in the community led many to question whether any substantial improvement in mobility would result. They argued that accessible transit is a less effective alternative for improving the mobility of handicapped individuals than solutions involving combinations of paratransit and conventional transit. The high cost of implementing the changes mandated by DOT's rules for Section 504, coupled with predictions that these changes would remove barriers for relatively few users, created considerable controversy.\*\*

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\* There were also specific requirements for rail systems.

\*\* The controversy has extended to members of the handicapped community as well as transportation professionals. Some handicapped persons argue very strongly for mainstreaming via accessible fixed-route service, rejecting the notion of "separate but equal." Others argue just as vehemently that mobility is a prerequisite to achieving full equality.

On June 29, 1979, the American Public Transit Association and 12 transit systems filed suit asking for preliminary and permanent injunctions barring enforcement and implementation of the regulations on the basis that:\*

- DOT and HEW went far beyond their statutory authority in drafting the regulations;
- The regulations were arbitrary and capricious in their requirement of technology which does not exist and in their use of theoretical "accessibility" as a standard rather than actual effects in providing mobility; and
- DOT failed to follow its own required procedures for environmental impact statements.

The U.S. District Court ruled that the 504 regulations would stand pending the filing of an environmental impact statement by USDOT. The decision also made reference to congressional authority in the matter, pointing out that "Congress is actively considering the regulations and the policy decisions there reflected."\*\* APTA appealed the February 7 ruling and the decision was eventually reversed. The court said that 504 was a non-discrimination statute that did not require "extensive and costly affirmative action."

The inauguration of the new administration in 1981 resulted in a change in the implementation of Section 504. The administration's proposal was unveiled in May and put in effect on July 20, 1981 in an interim final rule issued by the Office of the Secretary. It calls for recipients of financial assistance to certify that they are making special efforts to provide transportation to handicapped persons through locally determined methods. Although UMTA would not specify a program design to meet the "special efforts" requirement, it gave illustrative guidelines:\*\*\* (1) a program for wheelchair users and semi-ambulatory handicapped persons that involves expenditure of 3.5% of the Section 5 funds received by the urbanized area; (2) purchase of only wheelchair-accessible new fixed-route equipment until one-half of the fleet is accessible, or provision of a substitute service of comparable coverage and service levels; and (3) any system design that would assure every wheelchair user or semi-ambulatory person public transportation of 10 round trips per week (if requested) at fare levels comparable to those on standard transit buses. Thus, the regulation effectively rescinded the Section 504 rules and returned to the "special efforts" policy DOT introduced in Section 16 in 1976.

During the controversial period from 1978 to 1981, the attitude towards the 504 rules varied from one transit property to another. Some transit authorities felt that their responsibility would end with putting (fixed-route) buses on the street, and they were quite willing to purchase lift-equipped vehicles. In particular, many smaller properties, for whom the cost

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\* "APTA Sues Federal Government Over Accessibility Regulations," Passenger Transport, American Public Transit Association, July 6, 1979, p. 1.

\*\* "Court Rules - 504 Regs to Stand," Passenger Transport, American Public Transit Association, February 8, 1980, p. 1.

\*\*\* "Federal Register, Vol. 46, No. 138, July 20, 1981, "Nondiscrimination on the Basis of Handicap; Interim Final Rule and Request for Comment," pp. 37488-37494.

of 504 compliance was relatively low, proceeded to implement full accessibility before the 1982 deadline. At some larger properties, the controversy was outweighed by local or state policies in favor of accessibility. Both the Southern California Rapid Transit District and the Seattle METRO had announced plans to make their fleets fully accessible long before the 504 regulations were finalized. The States of California and Michigan require that all buses purchased be accessible.

On the other hand, some properties had been hopeful that the 504 regulations would be modified and that increased flexibility would be afforded to the localities in meeting accessibility guidelines. These properties are unlikely to make fixed-route accessible service the mainstay of their Section 504 service, now that the regulations have been modified.

The developments in the transportation field described above parallel (and to a degree reflect) recent trends toward mainstreaming and deinstitutionalizing the physically and mentally handicapped population and providing education to all those with special needs. These factors, together with the fact that the elderly now comprise a greater percentage of the population than ever, will probably ensure a continuing interest in some form of accessible transportation services. With the return to "local option," the experience of the various experimental projects becomes especially valuable.

#### 1.2.2 Demonstrations and Service Implementations

The UMTA Service and Methods Demonstration (SMD) Program has been specifically addressing the objective of improved transportation services to the elderly and handicapped through a number of projects. Throughout the course of these demonstrations, special services have been implemented and innovative techniques have been the subject of experimentation. Many alternative service concepts have been demonstrated through UMTA'S SMD program including:\*

- Service to the elderly and handicapped by a door-to-door transit system serving the entire community (Rochester, New York; Westport, Connecticut; and Danville, Illinois);
- Special door-to-door service for an eligible transit dependent market, where the general public may have other transit modes available (Syracuse, New York; Baton Rouge, Louisiana; Cleveland, Ohio; Portland, Oregon; Chicago, Illinois; Mercer County, New Jersey; and New York City);
- Special door-to-door service for an eligible transit dependent market, with sufficient surplus capacity to serve a limited segment of the general public (Naugatuck, Connecticut; Mountain View, California); and
- Fixed-route transit service with special equipment on the vehicles to accommodate the transit handicapped (Palm Beach, Florida; Champaign-Urbana, Illinois).

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\* Donald Kendall et al., Service and Methods Demonstration Program Annual Report, U.S. Department of Transportation, Transportation Systems Center, April 1977, p. 93.

In addition to these basic service alternatives, discounted fares and user-side subsidy\* demonstrations have been implemented to increase mobility for persons constrained by financial need (in Danville, and Chicago, Illinois; Kinston, North Carolina; Montgomery, Alabama; and Lawrence, Massachusetts). Finally, several demonstrations have included greater roles for taxi and other private operators in the provision of transportation services for handicapped and other transit dependents (Montgomery, Alabama; Portland, Oregon; Kinston, North Carolina; Danville, Illinois; and Lawrence, Massachusetts).

While demand-responsive doorstep services can provide maximum accessibility and convenience, they are potentially more expensive than fixed-route service if widely applied, since they are constrained to operate with lower productivities than conventional transit services. In dense urban areas, it is believed by some that there are opportunities to achieve greater economic efficiency through the increased use of conventional transit services if these services are made "fully accessible." Of course, until services were demonstrated, there was little concrete evidence as to the demand for this type of accessible service.

Conventional transit vehicles pose barriers to the physically disabled due to floor heights and high steps. The Transbus program recognized this fact and was to require (in accordance with Section 504 of the Rehabilitation Act of 1973) that all full-size buses ordered after September 1979 have significantly improved accessibility via lower floors, wider doors, kneeling suspensions, and a retractable ramp entry for wheelchair users. While the "Transbus" was never produced, progress was made in developing other new accessible buses which incorporated lift devices as well as lift equipment for retrofit of older buses. The TDT Steplift is only one of several lifts available. Lifts for transit buses are also produced by Vapor Corporation (Travelift), Lift-U, Transi-Lift, Collins and Environmental Equipment Corporation. In addition, General Motors Corporation manufactures its own lift. With some exceptions, bus manufacturers make more than one type of lift available with their bus models. Complete freedom in choosing the lift is not the case, however.

Lift-equipped fixed-route bus service is currently in operation in more than 100 locations across the country, with a total of over 6,000 buses or about 12% of the nationwide transit bus fleet. Table 1.2 summarizes the characteristics of some of these services.

In addition to evaluation of the SMD-funded projects in Palm Beach County and Champaign-Urbana, the SMD program has performed evaluations of the accessible service in St. Louis, Seattle, Atlanta, San Diego, and Connecticut.

Outside of the Federal-sponsored SMD program, there were state supported demonstrations and pilot projects. For example, California DOT performed four single-bus demonstrations of four different types of lifts in Sacramento, Alameda-Contra Costa Counties (AC Transit), San Francisco (Muni) and Long Beach.

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\* User-side subsidy is a term applied to programs which provide direct subsidies to transportation users (rather than providers), usually through the use of pre-paid (often discounted) scrips redeemable for transportation service(s).

Table 1.2

## ACCESSIBLE SERVICES (1980-1981 DATA)

Site	Bus/Lift Combination	Accessible Buses Scheduled in Peak	Percent Peak Fleet Accessible	Number of Routes Accessible	Percent of Routes Accessible	Period of Data	Daily Lift Boardings	Daily Boardings per Peak Scheduled Accessible Bus	Allow Standeers on Lift
Albuquerque	Flx 870/EEC	18	25	10	48	4/80-9/81	1.1	0.06	No
Birmingham	GM RTS/GM	NA	NA	7	27	10/81	0.1(est)	NA	Walkers
Boise	GM/EEC	9	38	4	27	2-10/81	0.0	0.00	Yes
Bridgeport	GM RTS/GM	16	40	14	100	10/81	2.0	0.13	Yes
Champaign-Urbana	Flx 870/EEC	11	33	3	30	9/81	3.3	0.30	No
Colorado Springs	GM RTS/GM GM/EEC	16*	40	9	100	10/81	2.0(est)	0.13(est)	No
Connecticut Transit									
Hartford	Flx 870/EEC	45*(est)	NA	21	100	10/81	0.8	0.02	Yes
New Haven	Flx 870/EEC	30*(est)	NA	18	100	10/81	1.0	0.03	Yes
Stamford	Flx 870/EEC	8*(est)	NA	8	100	10/81	0.1	0.01	Yes
Denver	Flx/TOT GM/EEC	124	NA	23	34	10/81	28.5	0.23	Yes
Detroit									
000T	GM RTS/GM	150	29	NA	14	1-5/81	0.4	0.00	No
SEMTA	GM RTS/GM	70(est)	22	7	15	1-5/81	1.5	0.02	Yes
Eugene	GM/Lift-U	15	27	10	42	10/81	17.5	1.17	Yes
Grand Rapids	Flx 870/EEC	10	14	10	67	12/80	0.4	0.04	No
Janesville	GM RTS/GM	7	41	7	100	10/81	2.2	0.32	Yes
Johnstown	GM RTS/GM	7	30	7	44	10/81	8.5	1.21	Yes
Kalamazoo	Chance/Vapor GM RTS/GM	47	100	13	100	9/81	2.9	0.06	Yes
Lafayette	GM/EEC	10	59	8	53	10/81	0.2(est)	0.02(est)	Yes
Laredo	TMC/TOT	14	70	10	83	7-10/80	0.0	0.00	Yes
Long Beach	GM RTS/EEC	6	4	2	13	10/81	1.4	0.24	No
Louisville	Flx 870/EEC Ikarus/Vapor	25	11	8	18	10/81	1.0(est)	0.04(est)	Not Encouraged
Milwaukee	Flx/Vapor GM RTS/GM	141	27	17	29	10/81	1.8	0.01	No
Monterey	Flx 870/EEC	9	32	12	48	9/81	0.5	0.06	No
Nassau County	Flx 870/EEC	107*	39	42	88	11/81	4.5(est)	0.04	Yes
New York City	GM RTS/GM	116	4	9	4	10/81	2.0	0.02	Yes
Northern Kentucky	GM/EEC	10	12	15	NA	10/81	0.3(est)	0.03(est)	NA
North San Diego	Flx/TOT	30*	31	6	21	Unk	NA	NA	NA
Oakland	Flyer/Vapor	155	20	12	8	1-10/81	66.6	0.42	Yes
Orange County	GM RTS/GM	141	42	15	28	10/81	17.6	0.13	No
Oshkosh	GM RTS/GM	12	100	11	100	10/81	5.5(est)	0.46(est)	No
Palm Beach County	TMC/TOT GM/TOT	50	100	19	100	1-7/81	4.1	0.08	Yes
Port Huron	Orien/Transi	9	100	9	100	5-10/81	0.0	0.00	Yes
Rhode Island	GM RTS/GM	40	19	25	32	9/81	1.9	0.05	No
Rock Island	GM RTS/GM	22	100	7	100	10/81	4.0(est)	0.18(est)	Yes
San Diego	GM/EEC	50	25	18	64	10/81	4.0	0.08	No
Santa Barbara	Gillig/Lift-U	5	9	3	11	10-11/81	0.5	0.10	Yes
Santa Cruz	AMG/TOT Flx 870/EEC Gillig/Lift-U	14	24	13	30	10/81	3.6	0.26	Yes
Seattle	Flyer/Lift-U	238(est)	26(est)	59	30	10/81	117.0	0.49	Yes
Sioux Falls	TMC/TOT	10	53	7	100	10/81	1.8	0.18	Yes
Washington	Flx/Vapor	102	6	37	28	7/81	3.4	0.03	Yes
Wichita	GM RTS/GM Chance/Vapor	31	74	17	100	9/81	4.5	0.15	Yes

\* Lift trips not noted on schedules

Source: Robert Casey, Transportation Systems Center

A study by the Transportation Systems Center reviewing accessible bus service experience to date produced the following findings:\*

- Most transit operators are experiencing low levels of lift utilization on accessible fixed-route service. Surveys have indicated that the majority of wheelchair users either cannot or have no desire to use fixed-route bus service.
- Delays due to lift boardings and alightings are generally small and very infrequent due to low ridership. Lift malfunctions on the road, however, can cause substantial delay. The random and infrequent nature of delays makes costly schedule changes unwarranted.
- Current lifts are more reliable than earlier models but still suffer from frequent malfunctions. As a result a high spare ratio is necessary.
- Operator error and accidental damages have contributed substantially to maintenance costs.
- The principal added costs to the operator of providing accessible service are the annualized equipment purchase cost, maintenance costs and the costs of driver and mechanic training. Recent demonstrations have shown their costs to be as much as several hundred dollars per passenger trip.

### 1.3 EVALUATION OVERVIEW

The Transportation Systems Center (TSC) was responsible for evaluating the demonstration for UMTA, through its evaluation contractor Multisystems. The major focus of the evaluation was the impact on the disabled, particularly the wheelchair-confined disabled. The evaluation addressed the quality of service offered to this market segment and their resulting travel behavior, as well as impacts on the operator and other transit riders.

This report should prove useful to all localities interested in the service concept and should help UMTA in guiding further policy decisions by the federal government regarding transportation for the handicapped.

#### 1.3.1 Key Evaluation Issues

Since the operation of a 100% accessible fleet in fixed-route service is a relatively new approach to providing service for the handicapped, much could be learned from this demonstration. Key issues of interest are described in great detail below; their evaluation is described in succeeding sections.

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\* R. Casey, The Accessible Fixed-Route Bus Service Experience, U.S. Department of Transportation, Transportation Systems Center, May 1981.

## Planning and Implementation Strategy

Among the important questions were how various interest groups were involved in planning, how labor issues were resolved, how implementation was staged and what marketing efforts were necessary. Labor issues were a primary concern since transit drivers have generally not been involved in dealing with handicapped persons and could have been concerned about the added responsibility of insuring the safety and welfare of physically handicapped people. Furthermore, operation of the lift could have been perceived as an additional job task and developed into a labor-management issue.

Marketing a new transportation service to the physically handicapped and mobility-disadvantaged is a difficult task due to the lifestyle accommodation handicapped people may have made to their present mobility limitations and the psychological barriers to travel that may have developed. PBCTA's approach to the marketing problem provides valuable experience in the field.

## Equipment Characteristics

Previous implementations of lift service have experienced problems with equipment reliability and durability. Palm Beach County's Lift Line service (operated by HRS) utilized a lift-equipped vehicle whose lift became inoperable and too costly to repair. While the lift used by the PBCTA has been put into service elsewhere, the Palm Beach County demonstration is another test of its design. Thus, equipment design, reliability, and durability were evaluated from the lift-user, non-user, driver, and operator perspectives.

## Level of Service/Supply Characteristics

Key issues regarding the quality of the transit service may be grouped in three categories, differentiated by the group impacted:

For disabled persons who utilize the lift, primary issues were the ability of users to rely on the service, the travel time and cost of the lift-bus compared to previous travel modes, and the convenience of a fixed route service.

For able-bodied riders, major issues were actual effects of lift operation on the travel time, frequency and reliability of the bus service, and rider perceptions and reactions.

For disabled non-users of the service, major issues included how these non-users perceived the level of service, whether coverage was adequate, and what alternative modes they had available to them. The evaluation aimed at determining whether this non-user group was made up of those who:

- a. were prevented from using the service by environmental barriers,
- b. could not use the service due to its physical design,
- c. were not served due to lack of coverage, or
- d. were adequately served by other modes (private automobile)

## Travel Behavior

Ridership Trends. On the aggregate level, it was important to determine the extent to which handicapped ridership and total ridership were increased due to the lift service. While equipping fixed route buses with lifts provided the capacity to serve large numbers of disabled people, the nature of fixed route service could prevent a significant portion from making use of it. It was important to investigate what new markets were attracted to transit via the lift option and whether existing riders were lost due to any deterioration in level of service caused by use of the lifts.

Characteristics/Behavior of Disabled Users and Non-Users. The evaluation investigated the key characteristics that distinguished lift-users from non-users and various aspects of user and non-user travel behavior. Of particular interest were difficulties experienced with the lift, reasons for not using the lift-bus, availability of other travel modes and impacts on total mobility.

Operator Productivity and Economics. While the installation of lifts on buses in fixed-route service was aimed at serving the disabled on the existing system and not overlaying new services on the present structure, there were increases in cost due to the project. Additional costs incurred by the operator due to the lift service included maintenance and repair, marketing and training as well as initial capital outlays for equipment.

Since considerable expense was devoted to retrofitting buses with lifts (and to maintaining them), the utilization of the lifts by both wheelchair and non-wheelchair users was an important operator issue. The evaluation also examined impacts on the utilization of the vehicle fleet due to increased dwell times at stops, longer layovers and more spares required to maintain reliability, and increased out-of-service time.

External Impacts. The introduction of the lift service could have had impacts on taxi companies, private handicapped transportation operators and social service agencies. Important issues included whether social service agencies were relieved of some of the burden of providing for elderly and handicapped transportation and whether private operators were adversely affected by CoTrans' lift service.

Social service and community agencies could also have had experienced increased activity if a substantial improvement in transportation for the handicapped was effected. The impacts of transportation on the provision of social services and on the participation of the elderly and handicapped in activities in the community are important issues. Unfortunately, lack of success in obtaining meaningful data from social agencies limited the investigation of these impacts.

### 1.3.2 Overview of Project Data Collection

In order to address the key issues discussed above, the evaluation utilized a number of data sources. Among the primary data sources were travel diaries and surveys of the disabled population, both lift-users and non-users. Some lift-users were identified through the PBCTA handicapped identification card program; non-users and additional lift-users were identified through social service agency affiliations, disability property tax exemptions and the

media. The travel diaries provided detailed information on tripmaking while the surveys provided data on the socioeconomic, health, and disability characteristics of the individuals and on their perceptions of the lift-bus service. In addition, routine driver boarding counts were expanded to include data on lift use.

Besides data collection activities among the disabled population, several sources were utilized to obtain data on other impacted groups. The perceptions of the able-bodied bus riders were obtained through on-board surveys. Surveys and/or interviews were conducted with bus drivers, maintenance staff, and the PBCTA management to obtain the operator perception of the project. Dispatcher records and time checks (on-street and on-board) provided reliability data. Financial records and maintenance records provided additional data on operations. Social service agencies, taxi operators, and private chair-car operators were contacted to investigate the impacts of the project on other transportation services and on social services.

## 1.4 READER'S GUIDE

The evaluation is presented in eight sections. Section 1 discusses the project background and objectives. Section 2 outlines the setting in which the project took place. Section 3 discusses the planning required for the project and various implementation and operations issues. Section 4 deals with equipment issues. Sections 5, 6, and 7 describe impacts on level of service, travel behavior, and operator productivity and economics, respectively. Section 8 discusses project conclusions and their transferability to other sites.



## 2: PROJECT SETTING

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The accessible bus demonstration encompassed public transit service operated throughout Palm Beach County. This section of the evaluation provides a description of the geographic, demographic, and transportation characteristics of the project site, as a background for analysis of project impacts and a foundation for assessing transferability of the demonstration's results.

As in most Service and Methods Demonstration Projects, land use and transportation supply are site-specific characteristics that affect demonstration results. In this project, additional factors such as the accessibility of the environment and the locational distribution of the target market are important to investigate.

### 2.1 GEOGRAPHIC AND DEMOGRAPHIC CHARACTERISTICS

#### 2.1.1 Geography, Topography and Climate

Palm Beach County is located in the southern portion of the State of Florida (see Figure 2-1). Its hub, West Palm Beach, is 75 miles north of Miami. The county occupies an area of over 2,500 square miles, most of which is made up of swamp land and lakes. Population is concentrated in a 10 mile wide by 45 mile long strip along the Atlantic Ocean, and in a number of settlements on the edge of Lake Okeechobee about 45 miles west of Palm Beach (see Figure 2-2).

The area is largely flat and much of the county is devoted to agriculture and conservation areas. As the population has grown, residential (largely condominium) development has begun to spread westward. Nevertheless, little urbanization has occurred west of Florida's Turnpike, which runs in a north-south direction about 5 miles west of Interstate 95. Most of the dense development lies along the coastal areas served by two major parallel (limited access) highways, U.S. 1 and A1A. A1A runs along the coastal island strip on which the most affluent portion of the population resides.

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\* Major sources of data included in this section were Palm Beach County Maps, Charts and Statistical Data, Area Planning Board of Palm Beach County, 1977 and 1980/1981.

Figure 2-1

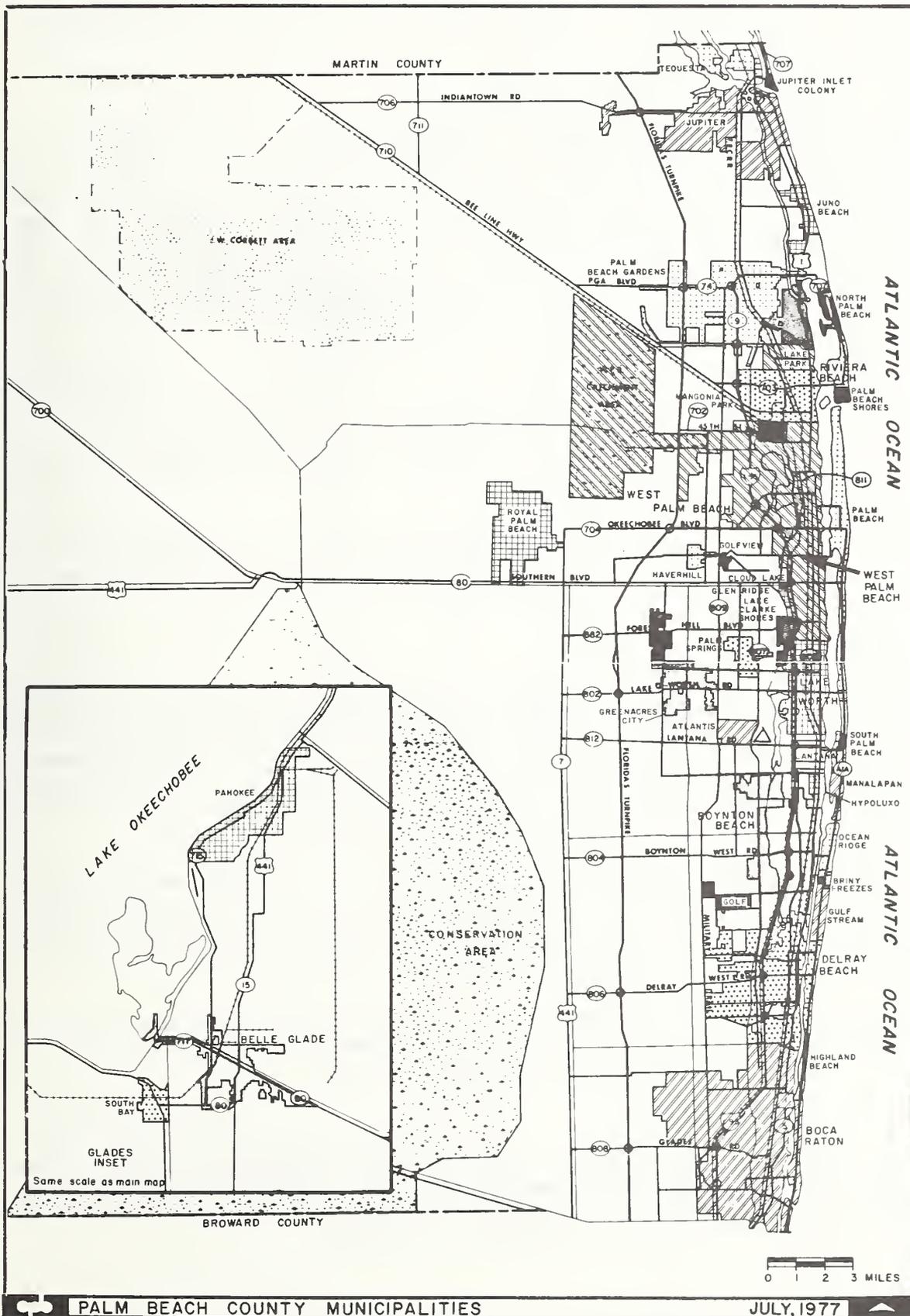
LOCATION OF PALM BEACH COUNTY



Source: Area Planning Board of Palm Beach County, Maps, Graphs and Statistical Data 1980/1981.

Figure 2-2

GEOGRAPHY OF PALM BEACH COUNTY



Source: Area Planning Board of Palm Beach County, Maps, Graphs and Statistical Data 1980/1981.

Palm Beach County, like South Florida in general, enjoys warm winters which have attracted northern vacationers and retirees. Winter temperatures average 65° F, while summer temperatures average 82° F. Rainfall is substantial, averaging over 60 inches per year.

#### 2.1.2 Population Characteristics

The total population of Palm Beach County was 573,125 in 1980, an increase of nearly 60% since 1970 (see Table 2.1). There are 37 municipalities in the County, with a total population of 363,904 residing in an area of 183 square miles (based on preliminary 1980 Census figures). The largest of these municipalities are West Palm Beach (1980 population of 62,530), Boca Raton (49,505), Boynton Beach (35,624), Delray Beach (34,325), Lake Worth (27,048) and Riviera Beach (26,596). Belle Glade, located at the western edge of the county is the next largest municipality with a population of 16,535. The largest growth in population in the past decade has occurred in the unincorporated areas where 36% of the population currently resides.

In 1980, the county median age was 39.7 (21% under age 18; 30% age 60 and over). Characteristics of the population vary considerably by residential location. The municipalities with the greatest percentages of senior citizens (age 60 and over) were Palm Beach and Lake Worth, each with over 40% in this age group in 1970. Palm Beach had the highest median age (58.8), while South Bay had the lowest (21.2).

Median family incomes also vary greatly across the municipalities of the county; in 1970 the median income in Palm Beach was about four times that in Lake Worth or Belle Glade.

#### 2.1.3 Economic Activity

As a result of Palm Beach County's concentration of retirement communities and resort areas, a considerable portion of economic activity is devoted to "services" and "trade." In 1979, of the 193,700 persons employed in Palm Beach County, 26% were involved in "trade" and 24% in "services." "Contract construction" has been an important area of employment over the past decade, peaking during 1973 and 1974 and reaching even higher levels in 1979. Average unemployment was 6.4% in 1979 compared to 5.8% nationwide.

Retail sales in Palm Beach County have grown tremendously as the population has increased. Total sales in 1979 were \$3.6 billion as compared to \$938 million in 1970. The greatest growth in dollars is evident for "food", "building materials" and "gasoline" although some of this growth may be due to dramatic price increases for these products over this period.

In the central and western portions of the county, agriculture is the predominant activity. Despite the increasing urban development in the county, the total acreage harvested has continued to increase.

#### 2.1.4 Target Population

The demonstration project was aimed at enabling transportation-handicapped (TH) persons to utilize CoTran, the County Transit System. The TH population is comprised of a number of different subgroups, including elderly and non-elderly, wheelchair-users and semi-ambulatory persons.

Table 2.1

SELECTED SOCIOECONOMIC CHARACTERISTICS  
FOR MUNICIPALITIES POPULATIONS OF OVER 3,500

	Total Population	Median Age*	% Under 18 Yrs.*	% 60 Yrs. and Over*	Median Family Income*	% Black
<u>Palm Beach County</u>	573,125	36.0	29.7	23.4	\$ 9,112	13.5
West Palm Beach	62,530	38.3	25.5	25.2	8,382	24.4
Boca Raton	49,505	42.6	23.7	31.6	12,179	1.9
Boynton Beach	35,624	42.8	27.3	32.3	7,724	17.6
Delray Beach	34,325	34.1	32.3	24.2	8,659	24.0
Lake Worth	27,048	54.3	18.2	42.4	5,148	5.0
Riviera Beach	26,596	30.2	34.4	17.8	7,677	66.9
Belle Glade	16,535	24.2	41.4	7.8	6,148	52.9
Palm Beach Gardens	14,407	28.7	39.4	9.7	13,000	0.3
North Palm Beach	11,344	34.1	34.3	14.2	14,285	-
Jupiter	9,868	34.2	31.3	18.1	9,138	0.4
Palm Beach	9,729	58.8	14.4	46.6	22,994	0.8
Greenacres City	8,843	N.A.	N.A.	N.A.	N.A.	0.1
Palm Springs	8,166	26.4	39.0	6.1	11,439	0.7
Lantana	8,048	43.8	25.7	16.6	8,763	2.0
Lake Park	6,909	34.1	29.7	34.6	10,917	9.0
Pahokee	6,346	25.6	40.5	8.7	6,847	45.4
South Bay	3,886	21.2	46.3	5.1	7,158	68.0
Tequesta	3,685	47.3	25.1	29.0	12,157	0.1
Unincorporated Areas	209,221	N.A.	N.A.	N.A.	N.A.	4.5

\*1970 Data

KEY: A dash (-) represents zero.  
N.A. indicates not available.

SOURCE: U.S. Bureau of the Census, 1970 and April 1980 (Advance Counts)

National statistics from a recent U.S. DOT report, Summary Report of Data From National Survey of Transportation Handicapped People, indicate that on the average:

- 5% of the nation's population is TH;
- 47% of these are 65 and over (67% are 55 and over);
- About 21% of the elderly population (65 and over) is TH;
- Only 5-1/2% of the TH use wheelchairs;
- 26% use other mechanical aids;
- The Southeast United States has the highest concentrations of TH in the country (about 1.5 times the national percentage);
- Only 23% of the TH employable age group are employed, compared to 64% of the total population; however, lack of transportation does not appear to be an important reason for unemployment.

This national information was used to obtain a rough estimate of the total target population for the demonstration. We may estimate that in 1980 there were 41,498 TH persons in the county, of which 2,282 used wheelchairs and 10,599 used other mechanical aids. Thus the primary target group numbers approximately 13,000. The mailback survey of West Palm Beach and Lake Worth residents can also be used to estimate the incidence of disabilities that might create a need for a lift. The survey showed that 6.4% of the population has difficulty climbing stairs and 1.0% use wheelchairs; applying these percentages to the entire county population yields an estimate of 36,700 and 5,700 individuals respectively.

Since approximately half of the TH are elderly, it may be expected that the substantial concentrations of TH occur in those municipalities and in those residential developments with large elderly populations (i.e., Palm Beach, Lake Worth, Boynton Beach, Boca Raton, Lake Park, Century Village/West Palm Beach, etc.). The Area Planning Board performed a study of elderly and handicapped transportation needs and has identified concentrations of these individuals.\* Figure 2-3 identifies concentrations of elderly and disabled people assuming that disabled are distributed in proportion to the general population. More information on disabled concentrations is shown in Figure 2-4, which identifies those traffic zones with a) over 200 elderly disabled individuals,\*\* b) over 10 non-elderly disabled, and c) over 10 CoTran handicapped identification card-holders.

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\* Kimley-Horn and Associates, Inc., West Palm Beach Urban Study Area Elderly and Handicapped Transportation Needs Study, Technical Memorandum No. 1, prepared for Palm Beach County, 1981 Area Planning Board

\*\* Note that elderly is defined as 60 years of age and over.

Figure 2-3

RESIDENTIAL CONCENTRATIONS OF THE ELDERLY

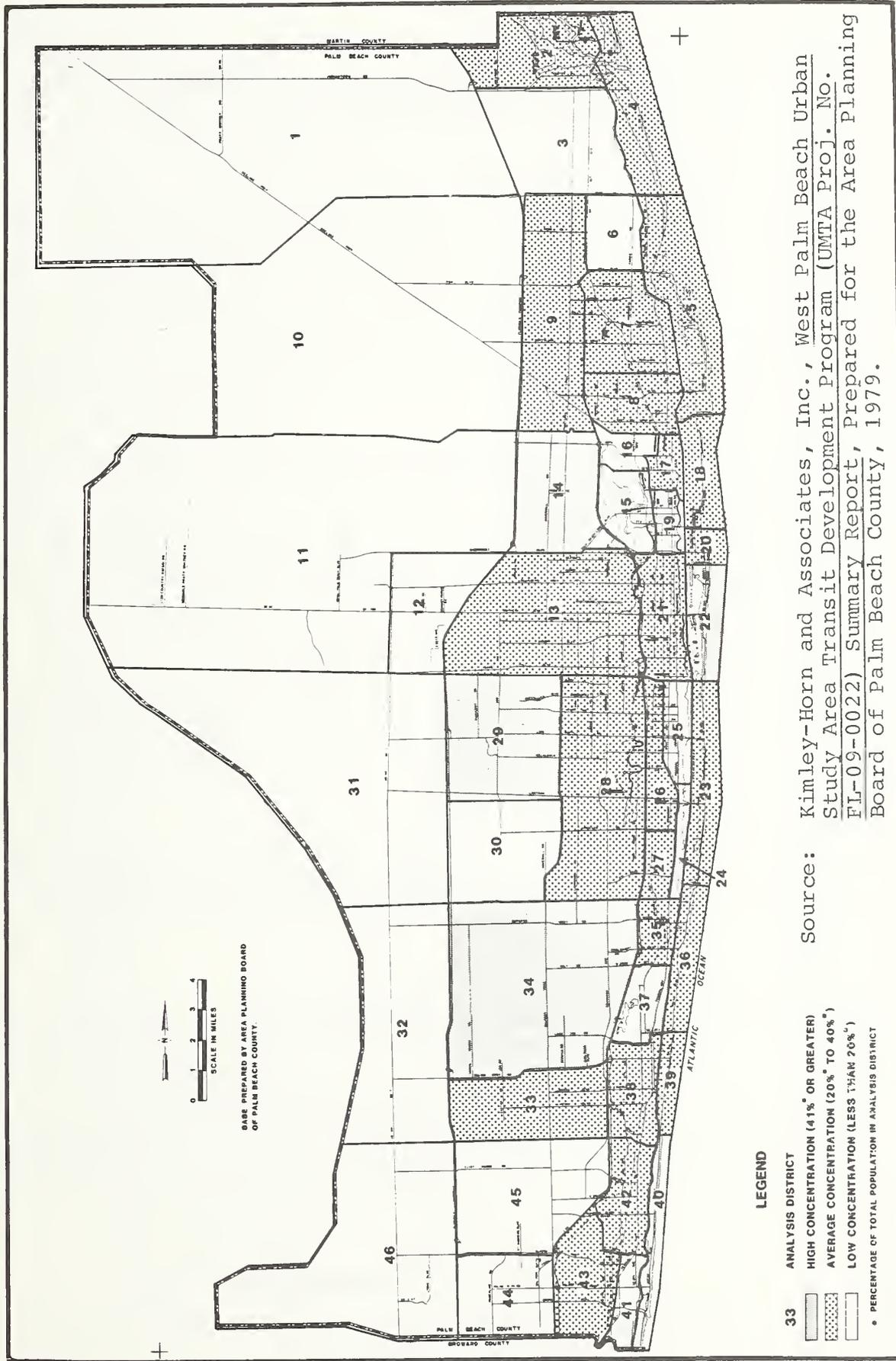
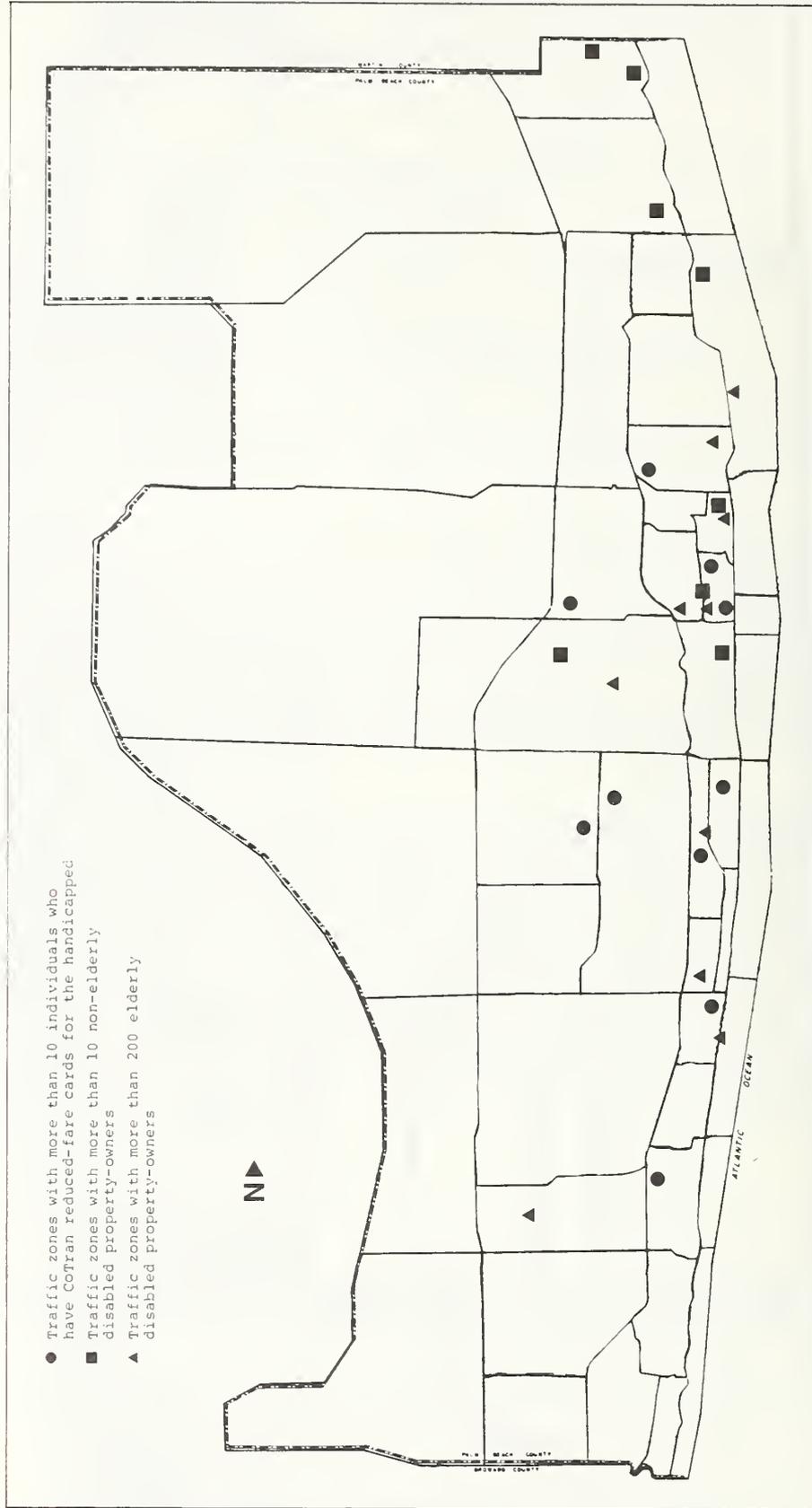


Figure 2-4  
RESIDENTIAL CONCENTRATIONS OF THE DISABLED



Source: Area Planning Board of Palm Beach County

## 2.2 TRAVEL PATTERNS OF THE TARGET POPULATION

Trip patterns of elderly and handicapped persons in Palm Beach County have only recently been studied. Based on data obtained from other sites, the recent E&H transportation needs study estimated that elderly residents make 20.5 round trips per month of which 43% are for essential purposes (work, school/training, grocery shopping and health care), and that non-elderly handicapped residents make 28.9 round trips per month of which 48% are for essential purposes. According to a small sample survey conducted in Lake Worth and Century Village (West Palm Beach) for that study, approximately 28% of the total elderly and handicapped population are unable to fully meet their travel desires. It was estimated that 4% of desired trips by elderly (0.9 trips per month) and 18% of desired trips by the non-elderly handicapped (5.2 trips per month) are foregone as a result. The survey samples of both groups exhibited substantially higher trip rates than the groups surveyed in other locations; however, it is believed that the sample may not be representative of the E&H population as a whole. It should also be noted that none of the survey participants were wheelchair users, thus limiting the applicability of the findings to this evaluation.

The National Survey of Transportation Handicapped People provides useful information on travel behavior of the target population nationwide which may be more applicable to this evaluation. The National Survey showed that while 98% of transportation handicapped persons travel, making an average of 29.5 trips per person per month, those who are elderly or are wheelchair users make fewer trips than average -- 20.4 and 21.8 respectively. Those TH 16 years old and over in mass transit areas made 29.1 trips per person per month as compared to 54.8 among non-TH.

The most frequent trip purposes among the TH are shopping, personal business, leisure/recreation, and medical. TH persons make fewer work or school trips, in part because many are also over 65. Those TH who do work travel at about the same rate as non-TH. Rates for medical trips are relatively higher among the TH; rates for shopping, personal business and leisure/recreation trips are relatively lower.

Availability of an automobile is the major determinant of mode choice. Of those TH who have an automobile available to them (68%), 14% use public transportation. Of the TH who do not have access to an automobile (32%), 42% use public transportation. Those who use automobiles are most likely to travel as passengers (only 32% of TH drive themselves as compared to 67% of non-TH).

Use of the bus is slightly higher among TH than non-TH: 29% of TH age 16 or over in mass transit areas use the bus as compared to 25% of non-TH. TH bus users rely on the bus for 41% of their total trips; for many, it is the only means of transportation.

Taxi use is considerably greater among TH than among non-TH; 14% of TH age 16 and over in mass transit areas use taxi as compared to 5% of non-TH. Very few (about 1%) of the total TH use human service agency vans; about 1% of the elderly and 7% of wheelchair users use such vans.

The National Survey also revealed other interesting information:

- Most TH travel during weekday non-rush hours.
- The majority (61%) of the TH do not need to be accompanied when travelling.
- Those who need assistance generally need it for the entire trip rather than to and from transportation.
- Wheelchair users and those with visual dysfunctions have the greatest need for assistance.

This information has important implications for the demonstration of lift-equipped fixed-route service. It suggests that there may be latent demand for social/recreational and shopping trips among the wheelchair disabled who have no automobile alternatives, but that a considerable portion of wheelchair users may need assistance both getting to and riding on the bus.

Little is known about the specific travel patterns of elderly and handicapped residents of Palm Beach County and how they may differ from other residents. There are substantial concentrations of elderly persons in the many large condominium and apartment developments designed for the retirement home market. Various senior citizen centers, social service agencies, health and medical facilities, and shopping centers dispersed throughout the eastern portion of the county serve this market group; it may be inferred that the result is a fairly dispersed travel pattern focussing on a number of small residential concentrations and travel generators. Table 2.2 lists important trip attractors for the target population as well as the general public.

## 2.3 TRANSPORTATION CHARACTERISTICS

### 2.3.1 Palm Beach County Transportation Authority

Public bus service was provided in the City of West Palm Beach by a private operator until 1971 when the Palm Beach County Transportation Authority (PBCTA) was established, operating 5 routes and 49 one-way route-miles. PBCTA is a publicly owned system, operated by Florida Transit Management, a subsidiary of National City Management which maintains two on-site staff members.

#### Institutional Structure/Financing

The Palm Beach County Transportation Authority is under the direct control of the Board of County Commissioners (see Figure 2-5). Three of the five commissioners serve on the Board's Transportation Committee. Citizen appointees of the Board serve on the Citizens' Transportation Advisory Board. This Advisory Board, in turn, has an Operations Committee which first reviews suggestions and petitions for service, received by the PBCTA.\* Although some members of the Advisory Board are senior citizens, none are handicapped persons or representatives of social service agencies.

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\* Petitions may come from local governments or real estate development corporations.

Table 2.2

TRIP ATTRACTORS

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Shopping

- 66 major shopping centers (over 50,000 square feet) throughout the County, primarily in coastal areas
- Largest is Palm Beach Mall (1.3 million square feet)

Employment

- 121 major employers (50 or more employees) throughout the county
- 37 are located in West Palm Beach
- 16 are located in Belle Glade, urban center of the western county
- Key non-agricultural employees:
  - Pratt & Whitney Aircraft -- 8,000 employees;
  - IBM (Boca Raton) -- 4,100 employees;
  - Southern Bell Telephone and Telegraph Co (West Palm Beach)--2,600 employees

Schools

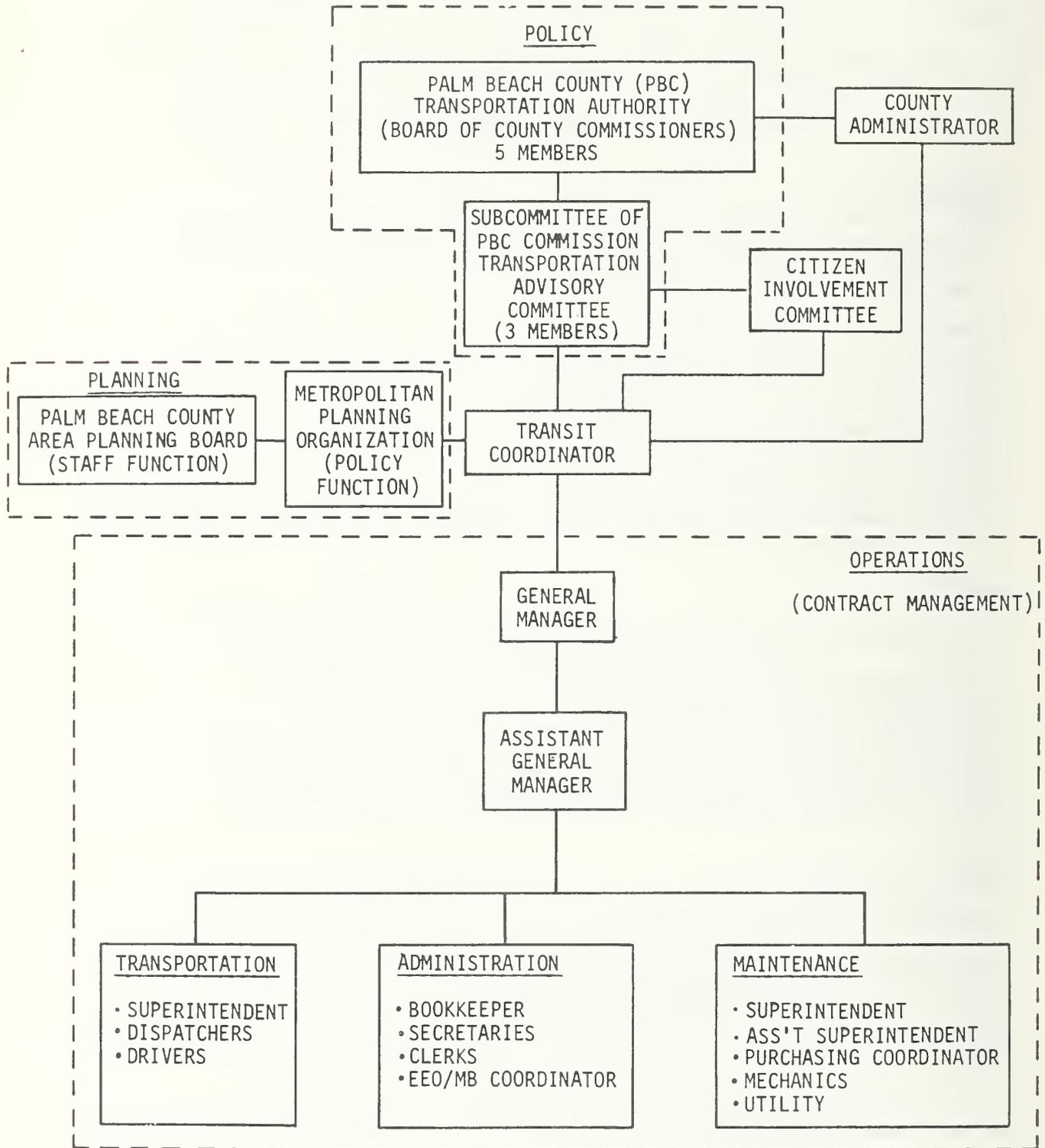
- 52 private schools (including 5 colleges)
- 93 public school (including 7 colleges and extensions)
- Key public colleges:
  - Florida Atlantic University (Boca Raton) -- 7,500 students
  - Palm Beach Junior College (Lake Worth) -- 7,200 students

Medical Facilities

- 11 acute care hospitals:
    - 3 in West Palm Beach
    - 2 in Belle Glade/Pahokee
    - 6 in other coastal municipalities
  - 23 nursing homes
  - Numerous other clinics and health facilities
-

Figure 2-5

PALM BEACH COUNTY TRANSPORTATION AUTHORITY ORGANIZATION CHART



Source: Kimley-Horn and Associates, Inc., West Palm Beach Urban Study Area Transit Development Program (UMTA Proj. No. FL-09-0022) Summary Report, Prepared for the Area Planning Board of Palm Beach County, 1979.

In addition to farebox revenues and federal aid, county ad valorem property taxes finance the operation. Individual municipalities make no local contributions to the transit operation. The State of Florida has no operating assistance program but does contribute a 10% share toward capital grants.

Bus operators (drivers) are members of the Amalgamated Transit Union. As is the case throughout Florida, CoTran is an "open shop".

### System Expansion

Within the seven years from 1971 - 1978, the system expanded significantly, largely due to petitions from citizens, municipalities and large residential developments in unincorporated areas. Just before the demonstration project began in 1978, the system operated 283 fixed-route miles throughout the County plus a dial-a-ride service in Boca Raton. The system continued to evolve at the onset of the demonstration. By May 1980, the system was about to undergo a major change in accordance with the Transit Development Plan.\* Thus, coincident with the start of accessible service on all routes in May, new buses were put in service, and the route structure was revised. In addition, a new name, "CoTran" (with an identifying logo and color scheme), was adopted and major marketing activities were initiated. Since the entire operation was changed at the initiation of demonstration's accessible service, it is difficult to make comparisons with CoTran service before accessibility.

### Routes and Schedules

Just prior to the introduction of lift-equipped service, PBCTA operated 14 public transit routes throughout the County. The system's monthly mileage totalled approximately 246,000 vehicle miles and 16,700 vehicle-hours. These figures exclude PBCTA's special services (charter, nutrition program, and Golden Lakes service).

The route structure as shown in Figure 2-6 consisted of a number of long routes along the County's major arterials. These included north-south routes connecting the various municipalities and east-west crosstown routes within the individual municipalities. Only in Boca Raton were there extensive local routes, including a dial-a-ride service which was discontinued in 1978.

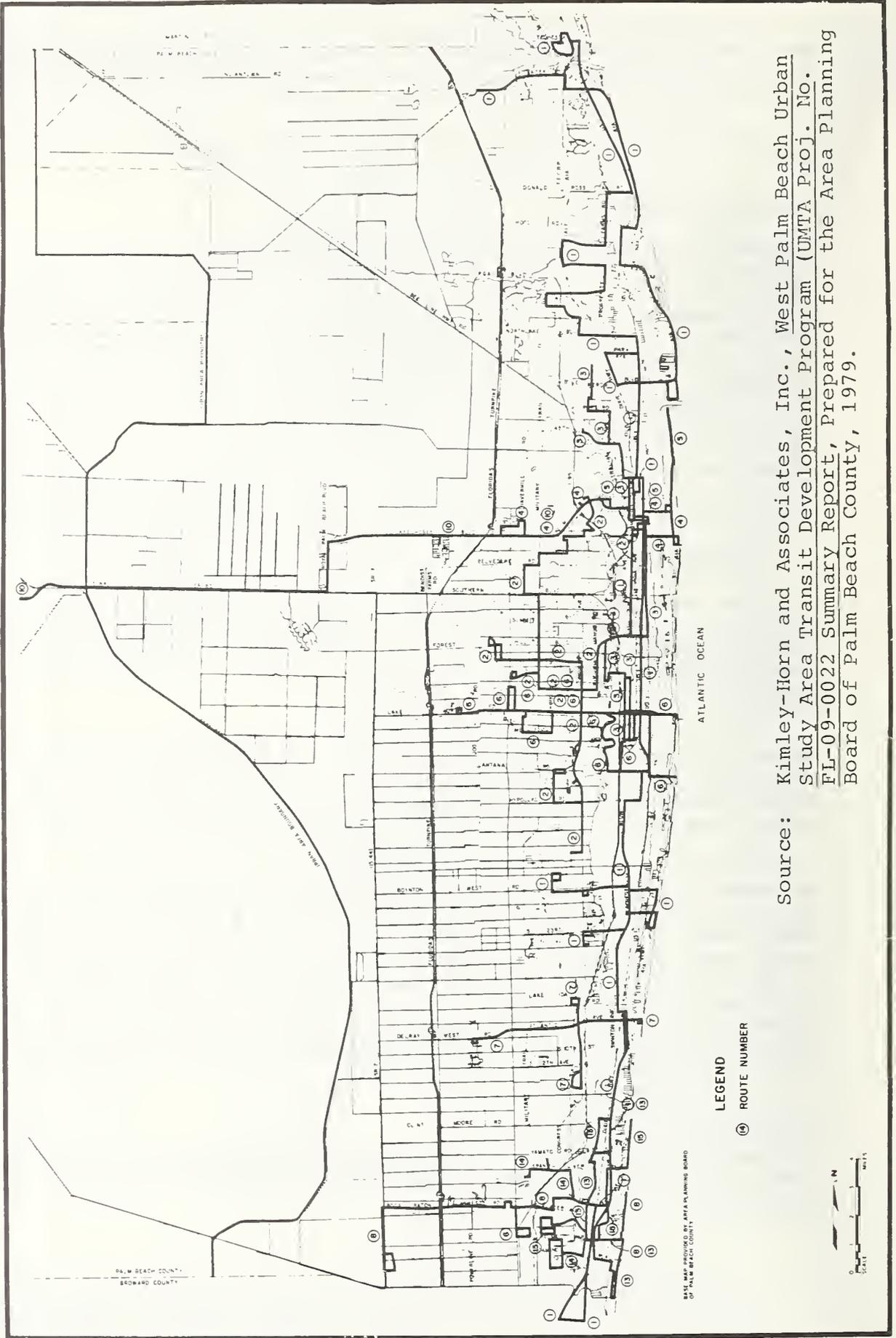
The above route structure was in place when lift service began on Route 3 in October 1979. The remainder of the system did not become accessible until May 1980 when major route revisions took place. Among the key elements of these changes was the division of the major coastal route into a higher frequency (20-minute) route in the West Palm Beach hub and lower frequency routes to the north and south branches. Boca Raton service was completely revised and reduced to a smaller number of routes. Finally, service was introduced on Military Trail where a number of new residential and commercial development have occurred. As a result of service changes, the system operated 401 one-way route miles of fixed-route service in 1981.

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\* Kimley-Horn and Associates, Inc. West Palm Urban Study Area Transit Development Program Summary Report, Area Planning Board of Palm Beach County, August 1979.

Figure 2-6

PALM BEACH COUNTY TRANSPORTATION AUTHORITY ROUTES  
(Pre-Demonstration)



Source: Kimley-Horn and Associates, Inc., West Palm Beach Urban Study Area Transit Development Program (UMTA Proj. No. FL-09-0022 Summary Report, Prepared for the Area Planning Board of Palm Beach County, 1979.

## Ridership

CoTran operated 3 million vehicle-miles or about 210,000 vehicle-hours of accessible service in the one-year period from May 1980 to April 1981. The total ridership over this period was 3,570,681. Of the regular route passengers, 32% were senior citizens who paid reduced fares. Other passengers include 25,761 charter passengers; 12,251 contracted service passengers; and 44,132 nutrition center clients (all elderly). A total of 38,130 passengers were handicapped persons who did not need to use a lift.

## Fares

The CoTran fare structure involved base fares plus special charges for transfers and for travel to outlying zones. Base fares were increased from 30¢ to 40¢ in late 1978, and to 50¢ in June 1981. (With the latter fare increase, transfer and zone charges were eliminated.) By the end of the demonstration, bus fares in Palm Beach County were 60¢ for adults and 30¢ for senior citizens (60 and over), children, and students going to and from school.

## Special Services

PBCTA currently provides special services under several contracts. Free rides are offered to clients of the State of Florida Department of Health and Rehabilitative Services (HRS). Special ID cards are issued to such clients and records of trips are maintained by the authority. In addition, the State pays for rides by CETA workers. Residents of certain developments are pass-holders who also ride for free (within a local zone). The State of Florida HRS and the local developments make third party payments to cover costs of free rides. As a result of budget cutbacks, the HRS contract declined in 1981 to \$25,000 from about \$90,000, four years earlier. The CETA contract amounts to about \$40,000. Other contract services also declined with the termination of a large contact with Century Village just before the demonstration study period.

PBCTA is also one of the operators of special transportation to nutrition sites for the elderly under a \$75,000 contract with the County Department of Human Resources. PBCTA provides a specialized fixed-route service, using five vehicles with checkpoint stops tailored to nutrition clients' residential locations.

Before the current program of reduced fare passes for the elderly and handicapped existed, a special two-year demonstration project called the Lift Line\* was in operation. This service was designed to assist clients of HRS services and to remedy the problem of missed appointments because of inadequate transportation (83% of client appointments had been no-shows). This service used six vehicles (five 17-to-23-passenger vehicles and one 50-passenger vehicle), one of which had a lift for wheelchair users. Five fixed routes and one demand-responsive "route" (in West Palm Beach) were operated. The demand-responsive "route" was a many-to-one service; all six

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\* An Evaluation of the Bus Transportation System (the Lift Line) of the Comprehensive Services Delivery System of the Department of Health and Rehabilitative Services (CSDS Report No. 12), Bureau of Research and Evaluation, Florida Department of Health and Rehabilitative Services, August 1973.

routes met at the Health Clinic in downtown West Palm Beach where passengers could transfer. At the end of the demonstration period, it was found that most users were served by the fixed routes; thus, these routes were absorbed into the regular PBCTA bus system and the pass program was instituted. The West Palm Beach demand-responsive service continues to operate, but without the benefit of the lift device, which has proven too expensive to repair.

The Boca Raton dial-a-ride and fixed-route services operated by PBCTA until the fall of 1978 utilized six small vehicles equipped with lifts to serve the handicapped. This service was available to the general public in the Boca Raton area. It is estimated that about 5% of trips on the dial-a-ride service were made by handicapped persons and that about 80 lift trips were made per month in 1978. Dial-a-ride service was discontinued due to the fact that PBCTA could not offer it throughout the county, and it was viewed inequitable to provide the service in only one municipality.

#### Equipment

PBCTA currently owns a total fleet of 72 buses, 63 of which are lift equipped. It operated 58 lift buses during the peak for most of the demonstration period, plus 5 non-lift buses used in contract services. During the demonstration, CoTran maintained an 8½% spare ratio for accessible buses. The current operating fleet is summarized in Table 2.3.

CoTran initiated the demonstration with a much older fleet of buses including 22 1954 and 1956 full-sized transit buses. These older buses were retired when used (but somewhat newer) buses were obtained from Dade County, and finally, when new buses were purchased. While the demonstration originally envisioned retrofitting 30 buses, it was later decided that it was not cost effective to retrofit these older buses. Instead, CoTran began lift services in May 1980 with 40 new TMC buses and 23 retrofitted GMC buses ranging in age from 4 to 20 years old.

Over the past few years, other improvements to Cotran facilities were made. Radios were installed in all the older buses and were, of course, included in all new buses purchased. A new office/maintenance facility, financed in part by UMTA, was constructed adjacent to the present facility and opened in November 1978. It helped to alleviate the cramped conditions existing at PBCTA at the time retrofitting first began.

### 2.3.2 Other Transportation Providers and Services

#### Local Transit Service Providers

Despite the expansion and consolidation of transit services in Palm Beach County under CoTran, there are still unmet transportation needs on the local level. An example of such needs can be found in Lake Worth where a city transportation system has been instituted to complement the county service. The deficiency of CoTran's service in Lake Worth relates to the lack of bus service within and between residential areas off the main highways. Since CoTran does not focus on transporting neighborhood residents to Lake Worth's retail core, local merchants instituted a trackless trolley service to meet this need. Three vehicles provide free transit during retail shopping hours. The service is very successful carrying 1200 riders each day, funding driver costs solely through advertising revenue. This service is not accessible, and

Table 2.3

COTRAN FLEET  
May 1981

Number	Year	Type	Seating Capacity	Lift-Equipped
4	1971	Flxible Flexettes F-81	19-23	No*
5	1976	GMC Transmode T2E366V	16-18	Yes* (inoperable lifts)
2	1960	GMC TDH5302	48-53	Yes
2	1960	GMC TDH4517	37-39	Yes
9	1974	GMC TDH4523A	34-37	Yes
10	1975	GMC TDH4523A	34-37	Yes
<u>40</u>	1980	TMC City Cruiser	30	Yes
72				

\*Not used in regular route service.

therefore there is still a missing link in transit service for disabled people in Lake Worth. No other municipalities in the county are operating local transit services, although there are other areas which experience similar problems of a lack of bus service in residential areas.

Social Service Agency Transportation

Fifteen private non-profit and public social service agencies provide transportation for the elderly and handicapped; some of these services are limited to particular age groups and trip purposes or restricted to program clients (see Table 2.4).

The most extensive program is that provided through the Older Americans Act, Title III funds (U.S. Department of Health and Human Services). Florida HRS receives Title III funds which are passed on to the Gulfstream Area Council on Aging, then to United Way of Palm Beach County, and finally to various agency operators. These operators include:

- Gulfstream Goodwill Industries
- Operation Concern
- Jewish Community Center
- South County Neighborhood Center
- Retired Senior Volunteer Program

Table 2.4

## HUMAN SERVICE AGENCY TRANSPORTATION SERVICES (1979-1980 DATA) FOR ELDERLY AND HANDICAPPED

Agency/Program	No. and Type of Vehicle	Lift Equipment	Equip. Usage Per Day, Week	Weekly Elderly	Ridership Handi.*	Eligibility	Annual Oper. Cost	Source of Funds	Method of Operation
American Red Cross of Boca Raton	1-9 Pass. Sta. Wag.	No	9 hrs./5 days	23	2	Blind; Crippled Children	\$ 2,420	United Way/Community Chest	Fixed Route and Demand Response
American Red Cross of West Palm Beach	1-4 Pass. Sta. Wag. 1-8 Pass. Sta. Wag. 1-9 Pass. Sta. Wag.	No	8 hrs./7 days	14	82	Blind; Crippled Children	4,800	Public Donations	Fixed Route and Demand Response
Association for Retarded Citizens	2-15 Pass. Sta. Wag.	No	7 hrs.	--	30	Mentally Retarded	32,782	POS Grant	Door-to-Door Service
Center for Group Counseling	1-9 Pass. Sta. Wag. 1-8 Pass. Van	No Yes	8 hrs./4 days 2 hrs./2 days	24	4	Program Client	10,582	Falk Foundation	Demand Response
Community Action Council	4-5 Pass. Sta. Wag.	N/A	9 hrs./5 days	18	9	Low Income	72,000	Community Service Administ.	Fixed Route and Demand Response
Community Mental Health Center	2-5 Pass. Sta. Wag. 2-6 Pass. Sta. Wag. 3-13 Pass. Sta. Wag.	No No 1	12 hrs./6 days	205	10	Program Client	32,811	State and County Donations	Demand Response
Gulfstream Goodwill Industries	4-13 Pass. Van 1-3 Pass. Van	No Yes	8 hrs./5 days	85	--	Senior Citizen	142,000	Federal, Local Title III-OAA	Demand Response and Fixed Route
Habilitation Center for the Handicapped	2-14 Pass. Van	No	4 hrs./5 days	--	140	Emotional, Mental, or Physically Handicapped; Program Clients	24,900	Title XX and Fares	Fixed Route

Table 2.4 (cont'd.)

HUMAN SERVICE AGENCY TRANSPORTATION SERVICES (1979-1980 DATA) FOR ELDERLY AND HANDICAPPED

Agency/Program	No. and Type of Vehicle	Lift Equipment	Equip. Usage Per Day, Week	Weekly Elderly	Ridership Handi.*	Eligibility	Annual Oper. Cost	Source of Funds	Method of Operation
Health and Rehabilitative Services	2 Auto	No	Staff Business	N/A					
	1 Sta Wag.								
	1 Van		Unassigned						
	1 Sta. Wag.		7 days-Palm Beach House						
	2 Van		5 days TRV Center						
	1 Sta. Wag.								
	1 Van		9 hrs./5 days						
	1 Auto		7 days						
	1 Van		7 days						
	1 Auto	No	9 hrs./5 days						
1 Van		24 hrs.							
2 Sta. Wag.									
Jewish Community Center	1-13 Pass.	No	8 hrs.	250	8	Senior Citizen	49,350	Title III-OAA	Demand Response
Mid-County Medical Center	1-15 Pass.	No	8 hrs./5 days	110	--	Program Unit	3,799	1/2 Federal 1/2 County	Fixed Route/ Demand Response
Palm Beach County Nutrition Program	(Use CoTran Buses)		3.5 hrs./5	447	--	Program	17,074	10% Local 90% Federal	Fixed Route
South County Neighborhood Ctr.	3 Van 2 Sta. Wag.	1 No	8.5 hrs./5	250	--	Senior Citizen	110,400	Title III-OAA CCE	Demand Response Mod. Fix Route
Urban League of Boca Raton	5-6 Pass.	No	4 hrs./5 days	63	20	Low Income	13,580	Personal Funds	Demand Response
YMCA of Boca Raton	3-15 Pass. Van 3-66 Pass Buses	No	9 hrs./5 days	--	30	Program	30,359	YMCA Programs	Fixed Route

\*Non-elderly

Source: Kimley-Horn and Associates, Inc., West Palm Beach Urban Study Area Elderly and Handicapped Transportation Needs Study, Technical Memorandum No. 1: Inventories and Analyses, 1981.

These Title III services are restricted to persons aged 60 and over but are not restricted to particular income groups or agency clients. Many trip purposes are served (including medical, social, personal business, shopping, etc.,) according to assigned priorities. The extensive Title III transportation program for senior citizens was developed in response to an HRS assessment that transportation was the most critically needed service in Palm Beach County. However, only two of these agencies have lift-equipped vans (one each) to serve elderly disabled, and the Title III program does not serve the under-60 population.

Handicapped persons under 60 years of age are served through special transportation services provided by certain agencies for their clients only. The Department of Health and Rehabilitative Services contracts with four agencies which provide transportation to mentally retarded clients in conjunction with training and/or service programs. These agencies include:

- Palm Beach Association for Retarded Citizens
- Glades Area Association for Retarded Citizens
- Palm Beach Regional Achievement Center
- Habilitation Center for the Handicapped

Other agencies which serve handicapped persons under age 60 include:

- American Red Cross (veterans, referrals, emergencies)
- Comprehensive Community Mental Health Center of Palm Beach County
- Center for Group Counseling
- Urban League
- Lions Industries for the Blind
- YMCA of Boca Raton

Some of the disabled clients have difficulty with regular buses but can utilize smaller vehicles without lifts. Nevertheless, because specialized transportation is lacking, there are some clients who cannot participate in human service programs.

Only 4 of 65 vehicles operated by the various human service agencies throughout the County are lift-equipped.

Over \$640,000 was spent in 1980 on social service transportation for elderly and handicapped in the West Palm Beach Urbanized Area (most of the county). This translates into \$3.60 per elderly and handicapped resident or \$1.10 per total resident.

A total of 54,400 trips by elderly persons and 17,500 trips by handicapped (non-elderly) persons were served by agency transportation, excluding HRS. In contrast, CoTran served twelve times the number of elderly and a little more than twice the number of handicapped (lift and non-lift).

While there are several agencies operating transportation services, it is clear that non-elderly disabled do not have transportation services to meet their general purpose travel needs such as shopping and personal business. In some other communities, public transportation agencies have established specialized door-to-door services to meet some of this need. However, in Palm Beach County no such service is available. Thus, for those non-elderly who

are not clients of a particular program, CoTran's accessible service is the only public transportation alternative.

#### Taxi Services

Both metered taxi service and non-metered "jitney" services operate in Palm Beach County. Yellow Cab Company is the largest taxicab service, operating 54 vehicles. Fifteen other smaller cab companies are operating throughout the county as well as two limousine services. Maximum fare schedules are set by the city commissions. West Palm Beach sets fares for the two taxi companies operating in the city limits. Between November 1979 and November 1981 these fares were 50¢ flag drop charge plus 20¢ for each quarter mile. Thus a 2-mile trip would have cost \$2.10, a relatively inexpensive taxi fare. No special fares for elderly or handicapped citizens were permitted by the city commissioner.

Jitneys are operated only in West Palm Beach and Riviera Beach by over 50 proprietors. Maximum fares are set for travel between and within specified zones by the city commissioners. West Palm Beach is divided into seven zones; travel costs \$1.00 within a zone plus 50¢ for each zone boundary crossed. Jitneys are operated and utilized largely by minority residents.

#### Intercity Bus

Intercity bus service operates between various cities in the county as well. Privately operated bus service is available between various localities, including: Pahokee, Belle Glade, West Palm Beach, Lantana, Lake Worth, Riviera Beach, Juno, Jupiter, DelRay Beach, Boca Raton, and Boynton Beach.

#### Medicar

For wheelchair-bound persons, an additional private service is available in Palm Beach County: Medicar Systems, Inc. This service is provided 12 hours a day using eight vans, each with a wheelchair lift/ramp at the rear of the vehicle. Reservation several days in advance is advised, although a trip requested for the same day will be served if a van is available. In 1980, 175 trips per week were served. The fare was \$20.35 plus \$1.27 per loaded one-way mile. The Veterans Administration Outpatient Clinic was paying \$85 per (round) trip for Medicar service for some of its clients during the period of the demonstration.

#### 2.3.3 Street and Highway System

Palm Beach County's highly developed east coast has an extensive network of highways. Interstate 95, a limited access facility, runs parallel to the coast through most population centers. U.S. 1, a major commercial arterial, runs parallel to I-95, about one mile to the east. This arterial serves the most dense urban development. Route A1A runs parallel to these routes along the shoreline serving residential, commercial, and recreational areas and has only one lane in each direction in many areas. At the western edge of the developed coastline area are Military Trail S.R. 809 (a major arterial), Florida's Turnpike (a limited access facility), and U.S. 441. In addition to these north-south routes, numerous state routes serve east-west traffic in the developed areas approximately every two miles. Only one, S.R. 80 (Southern

Boulevard), provides a direct east-west route between West Palm Beach and Belle Glade across the center of the county. Each urban area has a grid street pattern, except in newly developed areas in which less regular streets have developed. Another aspect of the road system which is noteworthy is the limited number of bridge crossings over the lake which separates the coastal island strip (Palm Beach) from the rest of the county.

#### 2.3.4 Accessibility of Sidewalks

In urban areas of the county, sidewalks with curbs are generally provided and various traffic control devices are utilized (e.g., signals, signs, lane striping, reflective markings, special left and right turning lanes and channelization). There are, however, many intersections without signals, where it is very difficult for handicapped persons to cross the street. While driveways are quite common, curb cuts (wheelchair ramps) at crosswalks are rare, although community development funds have been used in some communities to construct curb cuts.

The City of West Palm Beach constructed about 50 curb cuts in the downtown area as part of a single Community Development project (funded through federal revenue sharing). In addition, curb cuts are constructed whenever new street construction projects are undertaken or building permits affecting sidewalks are issued. There is, however, no coordination with CoTran to insure accessibility of bus stops. It appears that the City believes CoTran or the County should pay for curb cuts needed near bus stops.

Outside of West Palm Beach, very little has been done to make sidewalks accessible. For example, in dense Lake Worth, an area with a large elderly population, curb cuts are not extensive, although the City and State are now reconstructing the major crosstown arteries of downtown Lake Worth and installing curb cuts. Of course, all new construction complies with the State statutes requiring curb cuts. In many residential areas of Lake Worth, there are no sidewalks. In these areas curb cuts are not a relevant issue; however, the accessibility of the street system may still be insufficient for wheelchair users. Since sidewalk costs are assessed to property owners, a majority must approve the expense. In those sections of Palm Beach County with small tax bases, like Lake Worth, the current tax cap has hindered the ability of the municipalities to make sidewalk improvements.

## 2.4 SUMMARY OF EXOGENOUS FACTORS INFLUENCING DEMONSTRATION RESULTS

The Palm Beach County Accessible Bus Demonstration is just one of several projects designed to test the feasibility of fixed-route lift-bus service for meeting the transportation needs of wheelchair-users and other disabled people. South Florida's mild climate, flat terrain, and large retired population led to its selection as one of the test sites for UMTA's accessible bus program. These characteristics were likely to induce higher than average ridership on the lift bus service. The investigation of the project setting described in this section has pinpointed several other characteristics of the site and the project environment which could influence demonstration results. These include:

- low density urban development

- limited transit route coverage, service hours and frequency
- lack of an extensive and coordinated curb cut (wheelchair ramp) program
- lack of sidewalks in some residential areas
- limited alternative wheelchair-carrier services
- low-cost taxi service
- introduction of a major transit improvement program concurrently with the demonstration.

The first four factors are likely to have decreased ridership potential while the latter three may have increased it.

Among the most important of the exogenous factors are those which directly impact travel opportunities of the handicapped. Two such factors are the quantity of social services and the provision of social service agency transportation. Where there are a few lift vans serving the elderly, younger disabled people have few alternatives unless they are a client of a particular program.



# 3: PLANNING, IMPLEMENTATION AND OPERATIONS

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This section documents the history of the planning, implementation, and operation of PBCTA's accessible bus service. It provides a background for evaluating the results of the demonstration and illustrates problems that can arise for applications of the service concept elsewhere. The evaluation does not, however, assess the effectiveness of the planning and implementation strategy nor propose a plan for other demonstrations.

## 3.1 PLANNING

This section discusses the development of the service concept, the institutions responsible for the planning, implementation, and operation of the project and key concerns addressed during the planning process.

### 3.1.1 Development of the Service Concept

The concept of a demonstration of wheelchair-accessible fixed-route bus service was initiated by the Citizens' Transportation Advisory Board of the Board of County Commissioners. This followed the Lift Line pilot project (operated by the Florida Department of Health and Rehabilitative Services, HRS) which was aimed at increasing the effectiveness of HRS services by providing better transportation to centralized facilities. At the termination of that project, the following conclusions were drawn:

- Agencies were able to increase the number of single- and multiple-service referrals they made.
- Agencies experienced an increase in the number of referrals made to them.
- The number of missed service appointments steadily declined.
- Agencies were able to provide services more effectively.

Despite the success of the pilot project (it served 13,000 persons per month at a cost of 91¢ per trip), it was discontinued. Instead, the Lift Line routes were absorbed into the general PBCTA routes and schedules. Since most Lift Line vehicles were not equipped with lifts for wheelchair passengers, it was felt that Lift Line passengers could be served by the PBCTA. Since PBCTA

vehicles did not have lifts, there remained a major gap in service for the disabled. (Although PBCTA continued operating Lift-Line's demand-responsive service in West Palm Beach, the vehicle lost the use of its lift device because of mechanical failure; the lift could not be repaired at a reasonable cost.) It was at this point that it was suggested that the entire PBCTA fleet be made accessible.

### 3.1.2 Institutional Arrangements/Interest Groups

A number of governmental and private agencies, organizations, and interest groups have had important roles in the planning and development of the demonstration. The Palm Beach County Transportation Authority (PBCTA) was the grant applicant and the operator of CoTran, the County transit service. It designed the demonstration, acquired the equipment, trained drivers, conducted the marketing program, and was responsible for collection of data for the evaluation. The Board of County Commissioners serves as the "Authority" and is responsible for policy decisions, while the County Administrator acts as the liaison between the Authority and the operating company, Florida Transit Management. The operating company and the resident manager were directly responsible to the Administrator, the Authority, and UMTA for the demonstration.

A number of social service agencies and organizations which serve the handicapped were consulted by PBCTA during the planning phase and played some role in the implementation of the project, particularly with respect to marketing and driver training. These include:

- American Red Cross
- Barrier Free Design Committee
- Comprehensive Community Mental Health Center
- Crippled Children's Society
- Gulfstream Areawide Council on Aging
- Gulfstream Goodwill Industries
- Jewish Federation of Palm Beach County
- Mental Health Association of Palm Beach County
- Palm Beach Association for Retarded Citizens
- Palm Beach Habilitation Center
- South County Neighborhood Center
- State of Florida Department of Health and Rehabilitation Services
- United Way

Several agencies assisted in conducting handicap awareness training for CoTran's bus operators. In addition, representatives of agencies serving the disabled assisted in obtaining client participation in evaluation surveys and helped to conduct orientation sessions for interviewers, and a number of agencies participated in field demonstrations of the equipment.

Since drivers assumed added responsibilities as part of the demonstration, the drivers' union (Amalgamated Transit Union) was a primary interest group whose cooperation was solicited early in the planning process. About 4-5 months before training of drivers was to take place, the union was advised about the planned training program. According to Cotran management, the only significant issue that arose concerned payment for training hours. Cotran agreed to pay drivers straight time of not less than 2 hours for the training

activities. An effort was made to convey to drivers the social service aspect of the new service, which may have contributed to the fact that drivers and their union were supportive of the demonstration. The added responsibilities of drivers were outlined in the driver training program as follows:

- to operate the lift;
- to instruct the passenger in boarding and alighting procedures;
- to provide any assistance needed to insure passenger safety; and
- to record data on the use of the lift necessary for the demonstration evaluation.

Since the project was designed to enable handicapped persons to travel with little or no assistance, it was expected that the driver's role would be limited. However, drivers indicated in surveys that they often provide assistance to lift passengers when they are boarding and alighting, and more often, when they are securing themselves in the special tiedown positions. While many users request assistance, aid is often provided at the driver's initiative. The issue of any perceived burden resulting from the need for driver assistance apparently never arose in labor-management discussions and negotiations either during planning or after implementation.

### 3.1.3 Involvement of the Disabled Community

CoTran has no active elderly and handicapped citizen advisory committee. An elderly and handicapped subcommittee of the Advisory Board was formed in late 1979 as part of PBCTA's program to meet "special efforts" requirements of UMTA. The committee consisted of three members, including one disabled individual. The "committee" never became an institution of any significance, apparently holding only one meeting. As a result, there was no effective mechanism for input from the disabled community, despite the fact that there was officially a mechanism in place.

The Barrier Free Design Committee (BFDC), the most active organization in the disabled community, expressed considerable dissatisfaction with the degree to which CoTran has involved them in planning and implementing the demonstration. The BFDC felt that offers had been made to CoTran to assist with the project but that CoTran really did not want their input. The BFDC has been in existence since 1974, serving as a "watch" committee on accessibility of public buildings and providing input to local community development agencies. They have not been able to establish a similar working relationship with CoTran (although they did assist in the evaluation's survey efforts). The BFDC's criticisms of accessible service include: 1) CoTran's lifts cannot accommodate several types of wheelchairs due to inadequate platform length; and 2) there is only one tiedown position in the newer buses; and 3) CoTran used the term "fully accessible" in their marketing, despite the accessibility problem posed by the lift's limitations.

While BFDC members were interested in the project, enthusiasm was not evident in other parts of the disabled community. As a whole, the human service agencies were not interested in participating actively in the project, despite overtures made by CoTran. It is unclear whether this was due to

disinterest on the part of these agencies or reflected a past lack of rapport between the agencies and CoTran. The degree of interest in the project varied from agency to agency. Several agencies were very helpful in the survey efforts but few took an active role in promoting the service. Many believed few of their clients would use the service in its present configuration. An issue of particular significance was the lack of accessibility of bus stops to their facilities. A few agencies found they could not influence CoTran or the County to make adjustments to bus routes and bus stops that they perceived were necessary.

#### 3.1.4 Key Concerns Addressed in the Planning Process

Since it was expected that sufficient vehicles might not be available to introduce accessible service on all routes at once, plans were made initially to phase-in service a few routes at a time. Thus lift service began on one route in 1979. Subsequently, CoTran decided that a better strategy would be to implement the planned restructuring before proceeding with lift service expansion, and to introduce lift service on all remaining routes simultaneously as part of the new "CoTran" service.

To insure that service would be reliable even if vehicles experienced long and frequent out-of-service times due to lift malfunctions, spare lift-buses were maintained. Because the service was initiated with largely new vehicles, it was anticipated that maintenance requirements would be sharply reduced and that a small spare ratio (less than 10%) would suffice.

Because there was a possibility that drivers would balk at increasing responsibilities associated with the lift (e.g., refuse to provide assistance to lift-users, or request additional pay), the drivers' union was involved early in the process and training was designed to convey an understanding of the difficulties faced by disabled passengers.

### 3.2 IMPLEMENTING ACCESSIBLE SERVICE

Major implementation activities included retrofitting the older equipment, training drivers and other staff, and marketing the new service. This section describes these activities.

#### 3.2.1 Retrofitting Vehicles

The most important change to the Palm Beach County transit system was the addition of special lift and wheelchair tiedown equipment. The demonstration project originally envisioned 30 retrofitted General Motors vehicles supplemented by 6 older lift-equipped General Motors Transmode buses\* and 15 new lift-equipped vehicles. The need to replace aging vehicles, which became apparent as planning and implementation progressed, caused a revision in the project design. Forty new (twenty five additional) lift-equipped buses were ordered to provide the mainstay of the accessible fleet, supplemented by 23 retrofitted older "new look" vehicles. Note that the total fleet size was increased as service expansions took place.

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\* The lifts on these vehicles, first-generation models manufactured by Environmental Equipment Corporation, were later deemed to be in irreparable condition.

The retrofit program was a major element of the implementation process, beginning in March 1978, and ending over two years later in September 1980. There were a number of factors which made retrofitting such a time consuming process. Retrofitting began before the new vehicles were available and during a time when CoTran had insufficient mechanics to maintain its aging fleet. It should also be noted that PBCTA lacked adequate facilities for maintenance until its new facility was available in November 1978. As a result, the vehicles scheduled to be retrofitted could not be spared from regular service. The acquisition of additional used buses in June 1978 eased the situation so that 15 lift-equipped vehicles were ready for service on Route 3 in October 1979. Despite the new facility and the additional buses, PBCTA was operating without sufficient mechanic staff or spares into 1979.

PBCTA employed a local contractor (an Oldsmobile dealership) to install the lifts and other special equipment on its older GMC buses. The lifts were installed first, followed several months later by the special flip-up seats and tiedown devices. Installation of all the special equipment required approximately 170 mechanic-hours per bus.

PBCTA experienced several problems as the retrofitting was taking place. In March 1979, after a series of accidents in which lifts dropped from the stowed position and were damaged, PBCTA temporarily locked up the lifts until it obtained correcting "accumulator" devices to resolve the problem. These devices began arriving in June.

In early tests conducted in March 1979, with the help of some disabled volunteers, PBCTA found that even agile disabled with substantial arm strength had difficulty getting onto the lift platform due to the design of the sensitive edge. As a result, new "flush" sensitive edges were ordered from TDT. Service began on Route 3 with the old edges since the new edges did not arrive on the property until December 1979. No major problems were experienced with the old edge by the small number of users during the interim period.

### 3.2.2 Training of Drivers and Other Staff

Training of PBCTA employees took place during a 4 month period from July to October 1979. (Mechanics were trained in the maintenance and repair of the lifts as lifts were installed on the vehicles). Drivers were instructed in operation of the lift and in procedures for dealing with wheelchair passengers. There were originally no plans to pay drivers for participating in the training program. Drivers' roles in the demonstration were presented as an opportunity to take part in serving the community. However, discussions with the union convinced PBCTA, that the best way to insure driver attendance at training sessions was to pay drivers for their time (straight-time wages).

Bus driver skills training took place in a two-hour class. All operators had received the skills training before the lift service was instituted on Route 3 in October 1979. The purpose of these training classes was as follows:\*

- To familiarize operators with the lift.
- To teach operators how to use the lift properly.

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\* Interdepartmental Correspondence: "Lift Operation Training Program," Joseph Brown, CoTran Assistant Superintendent of Transportation, October 9, 1979.

- To show operators what conditions to try to avoid.
- To show operators the differences between the new coaches and the older, retrofitted coaches.
- To show operators what to look for and what should be reported to maintenance when checking lift operation before leaving the garage.
- To explain what problems to expect with wheelchair passengers.

The first hour was a classroom review of the technical aspects of lift. An exploded view of the lift assembly was used to show and explain the workings of such items as the safety door and the sensitive edge and mat devices, and to explain the workings of the instrument panel. The second phase of the class was held in the maintenance garage where the operators actually operated a lift module. Placing the lift in all positions, different problems were given to operators and they were given a chance to figure out solutions. The third and final phase of the class was conducted in a GMC coach, equipped with a lift and a wheelchair and allowed each driver to role-play as passenger and driver.

After a few months in operation, it became evident that operators were having trouble operating the lifts. A memorandum was issued to each operator in January 1980, including a step by step instruction sheet (see Appendix A)\*.

Drivers were required to cycle the lifts each day. This requirement was instituted for all "pull-out" drivers in May or June of 1980 after full lift service was initiated. It should be noted that lift cycling is still not required of "relief" drivers.

Awareness (sensitivity) training was conducted in July 1979 with the assistance of five organizations:

- Lighthouse for the Blind of the Palm Beaches
- Epilepsy Concern
- Project Outbound (Palm Beach Habilitation Center)
- Crippled Children's Society
- Florida Department of Health and Rehabilitative Services

Each organization presented an awareness session of 20 minutes to one-half hour. Included in the sessions were definitions of disabilities, instruction in the use and handling of wheelchairs, a discussion of attitudes towards disabled people, and a description of necessary bus driver skills. Some of the important messages conveyed were:

- It is not always obvious that a person is disabled
- Disabled people should be treated with respect not sympathy.
- The disabled person is the best guide as to how to provide assistance.

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\* Bulletin #126, Todd Bendfelt, CoTran Safety Supervisor, January 21, 1980.

- Accessible bus service is an important breakthrough for disabled people.
- Drivers should show friendliness to let the disabled person know that they are glad to have him/her aboard.

The session included a film on special-education school bus driving and some role-playing exercises. Attendance at these sessions was mandatory for all operating personnel.

Since the demonstration service began, training procedures have been modified. A new general driver training program developed by the Appalachian Regional Commission began in the winter of 1981. Lift-training has been incorporated into this program for new drivers. The awareness training has not been performed since the original sessions, since CoTran does not have its own formal awareness curriculum. However, there are plans to utilize George Washington University's awareness training program in the future, as substantial number of new drivers undergo training.

### 3.2.3 Marketing Activities

Marketing of the lift service was a high priority aspect of the demonstration project. UMTA allocated 20% of the grant or \$140,000 to cover the costs of marketing and training activities, most of which was earmarked for marketing. In fact, marketing activities accounted for about \$120,000. The marketing program for the demonstration was designed to "make every handicapped and elderly person in Palm Beach County aware that the Authority will have buses equipped with special equipment to provide full accessibility on the system's fixed routes".\*

During the demonstration planning phase, CoTran outlined the following marketing objectives and activities:

- Define for the marketing contractor the service goals and objectives;
- Develop priorities for marketing-related goals and objectives;
- Produce periodic press releases on the project's progress and success;
- Coordinate with various citizen advisory groups;
- Purchase radio and television time for advertising and news releases;
- Produce visual aids for training programs for the public and for agency clients;
- Prepare direct mailing to nursing homes and handicapped residents; and

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\* Palm Beach County Transportation Authority Newsletter, Volume 1, No. 1, September 1979, p. 2.

- Produce posters to be displayed at rehabilitation centers, health and social service agencies, and high-traffic shopping centers.

Fred A. Fetterly and Associates, a local advertising and public relations firm under contract to PBCTA to perform other marketing services, was awarded a three-year contract to carry out special marketing activities for the demonstration. The marketing contractor began work September 1977, several months after the award of the demonstration grant. Delays in start-up required extension of the marketing contract period nearly an additional year, through July 1981. Specific activities carried out by Fetterly and Associates also included:

- Newsletters for distribution to agencies;
- Special bus schedules for the handicapped and elderly;
- A slide film with sound track explaining how buses are equipped for the handicapped and how the equipment works;
- A speakers bureau, available for appearances before service agencies, civic clubs, doctors' groups and nursing homes;
- Training programs at large shopping centers to demonstrate the use of the special equipment;
- Public service radio and television programs;
- Use of billboards in Greater West Palm Beach;
- Bus signs;
- A brochure showing all facets of the fully accessible system to the handicapped and elderly;

As a result of the marketing contractor's efforts, media coverage was extensive throughout the implementation phase, culminating in a news conference to announce initiation of lift-equipped service on the first route and news coverage of the boarding of the first wheelchair lift-user at the Community Hospital of the Palm Beaches.

Lift demonstrations were an important element of the marketing program. These were held in May 1979, during National Handicapped Awareness Week, at the following four locations:

- Project Outbound, Habilitation Center, Lake Worth
- Goodwill Industries, West Palm Beach
- Multiple Sclerosis Society, West Palm Beach
- Crippled Children's Society, Palm Beach

Letters were sent to over 25 agencies to announce the demonstrations and to explain how the lift equipment could be utilized. These demonstrations also received media coverage. Three weeks prior to the start-up of service on Route 3, 2000 newsletters were printed and distributed to private and government agencies serving the disabled and to other key community leaders and officials. (See Appendix B.)

Only 10% of the marketing budget was used in the early phase of the project, in which service was initiated on one route. The bulk of marketing activities for the demonstration took place in conjunction with full service start-up in May 1980. New schedules with special descriptive information and illustration of the lifts were prepared and distributed (see Figure 3-1), newspaper insert brochures and magazines were printed and distributed through two local newspapers as well as directly to passengers (Figure 3-2), and billboards were installed throughout greater West Palm Beach.

Since full implementation of the lift service was achieved at the same time as the restructuring of the bus system (and inauguration of its new name, logo, colors, buses, etc.), the lift service marketing program was supplemented by other marketing activities of general interest. Furthermore, the activities geared to the demonstration served a dual purpose in also publicizing other service changes, e.g., new routes and schedules. CoTran ran 68 teaser advertisements over the four-week period leading up to implementation, starting the first week with "CoTran is Coming." Billboards were used just before implementation to advertise the new system and its accessibility; they carried the message: "Ride CoTran...Your Palm Beach County Transportation Authority Bus System...Fully Accessible to the Handicapped and the Elderly"\* (see Figure 3-3). Radio and television commercials started just before implementation and continued for two months for a total of 570 radio spots on 13 stations and 170 television spots on 3 stations.

Another element of the service start-up promotion was fare-free days. Ridership on the two fare-free days was well above normal. However, only 6 of 29,000 riders during these two days were wheelchair-users. (Of course this still represents a gain over the previous months when no wheelchair-users were riding on Route 3.) While the fare-free service was an effective promotion of the new bus system, use by disabled persons may have been discouraged due to the unusual crowding resulting from the promotion.

After the implementation period, marketing continued on a smaller scale with news releases on lift ridership, public relations stories and the preparation of a second newsletter and a 10-minute audio-slide show for use at community groups in conjunction with speakers from CoTran.

CoTran, the handicapped community, and the local planning agency all seem to believe that the goal of informing all county residents about the lift-equipped service has been met. However, several issues remain to be explained:

- Was the information provided sufficient to enable disabled persons to use the lift?
- Would more emphasis on training programs for disabled persons have been more fruitful in terms of lift-ridership?
- Could the disabled community have been involved to a greater extent in the planning of the marketing efforts? Would effectiveness have been increased as a result?

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\* Note that the word "fully" was dropped as a result of the opposition of the local disabled organization which challenged the use of the term "fully accessible" when power-drive chairs generally are too long for the lift platform.

Figure 3-1

COTRAN PROMOTIONAL BROCHURE



Supplement to The Post and Sun Sentinel, Sunday, May 4, 1980

**ride**  
**Go Tran**

Your County Transportation  
Authority

**MAPS, SCHEDULES & BUS  
INFORMATION**

Effective May 4, 1980

**FULLY ACCESSIBLE TO  
THE HANDICAPPED AND ELDERLY**

LIFT SERVICE DESCRIPTION FROM SCHEDULE



**ALL COTRAN BUSES ARE ACCESSIBLE TO THE HANDICAPPED**

in the nation to conduct a pilot program for the elderly and handicapped.

Total implementation of the project for accessibility on the fixed routes began on May 4, 1980. The demonstration program started on the Lake Worth-Riviera Beach route earlier in the year.

The wheelchair lift operation is quite simple. Upon stopping for a patron, the bus driver lowers and extends a ramp from the coach. The ramp is designed with safety features so chairs can not roll forward, back to the sidewalk or street. Once the patron is secure, the ramp is raised to the floor level of the bus by the driver. Once aboard, the wheelchair passenger maneuvers, or is aided by the driver, if necessary, just a few feet to a special seating area. Both wheels of the chair are

Among the first in the nation, a program now is underway to provide accessibility for the elderly and handicapped on the county transit system.

Special equipment includes hydraulically operated wheelchair lifts on all fixed routes and lock-in devices for safe seating. Drivers have been trained to aid the elderly and handicapped requiring personal help.

Made possible by a federal demonstration grant of \$689,000 through the Urban Mass Transportation Administration, the project provides the special equipment on 40 new, 30-passenger buses and a number of retrofitted coaches.

After application for the federal grant by the Palm Beach County Transportation Authority (County Commission), the transit system was selected as only one of two

locked to safety devices, seat belts are put into place and the patron is ready for a comfortable ride to destination.

The pilot program calls for various surveys and monitoring after implementation, exploration of fiscal aspects for possible changes in the types of transit service, recommendations to solve problems of the severely handicapped, general utilization of the system and exclusive studies by consultants retained by the Urban Mass Transportation Administration (UMTA).

Among the issues to be addressed by the demonstration program by UMTA consultants are:

—The full impact of accessible, fixed-route transit on the mobility and lifestyles of the

Ramp is raised by bus driver.

Ramp is lowered and extended from bus and wheelchair is backed onto ramp.

Disabled passenger then locks himself into place with a seat belt.

Inside of bus, wheelchair is backed into place where wheels are locked.

elderly and handicapped.

Various county agencies, dealing with the elderly and handicapped, have provided valuable input into the new service implemented by your Palm Beach County Transportation Authority.

The pilot project is a result of federal planning over two decades, an extension of the civil rights movement which began in the early 1960's. Congress moved to support the elderly and handicapped in 1964 with passage of the Urban Mass Transportation Act.

The act states:

"It is hereby declared to be the national policy that elderly and handicapped persons have the same right as other persons to utilize mass transportation facilities and services."

—The contrast between the demonstration's approach to the problem and any alternate approaches of separate, specialized transportation services for the el-

derly and handicapped.  
—Impact of the lift equipment and time element on regular, non-handicapped users of the system.

Figure 3-3

COTRAN PROMOTIONAL BILLBOARD



Since many non-users thought they would need instruction in how to use the lift, it is possible that a greater portion of the marketing funds would have been better allocated to consumer training efforts. Greater involvement of human service agencies and disabled community organizations in this effort might also have been useful. (An overture to these organizations by CoTran late in the demonstration period was unsuccessful; an interest in consumer training by the newly-appointed County Ombudsman for Citizens with Disabilities was unfortunately cut short by the elimination of the position during a budget cutback.) Issues of marketing effectiveness are discussed in Section 6.7 as well.

#### 3.2.4 Implementation Schedule

The demonstration grant called for lift service to be implemented in July 1978, two months after delivery of fifteen new small buses and retrofit of the thirty large vehicles. Due to changes in the grant and delays in the grant process, retrofitting, initially scheduled to begin in January 1978, began in March and proceeded slowly. The flip-up seats were obtained in September 1978 and installed at PBCTA after each vehicle was retrofitted. As a result, the first new vehicles were not available until November 1979, and retrofitting was not completed until September 1980. Marketing and training programs were delayed in conjunction with delays in service start-up. Figure 3-4 shows the implementation schedule.

### 3.3 OPERATIONS

This section describes the operation of lift-equipped buses. Major operational issues discussed include service changes, operating policies, and labor and staffing issues.

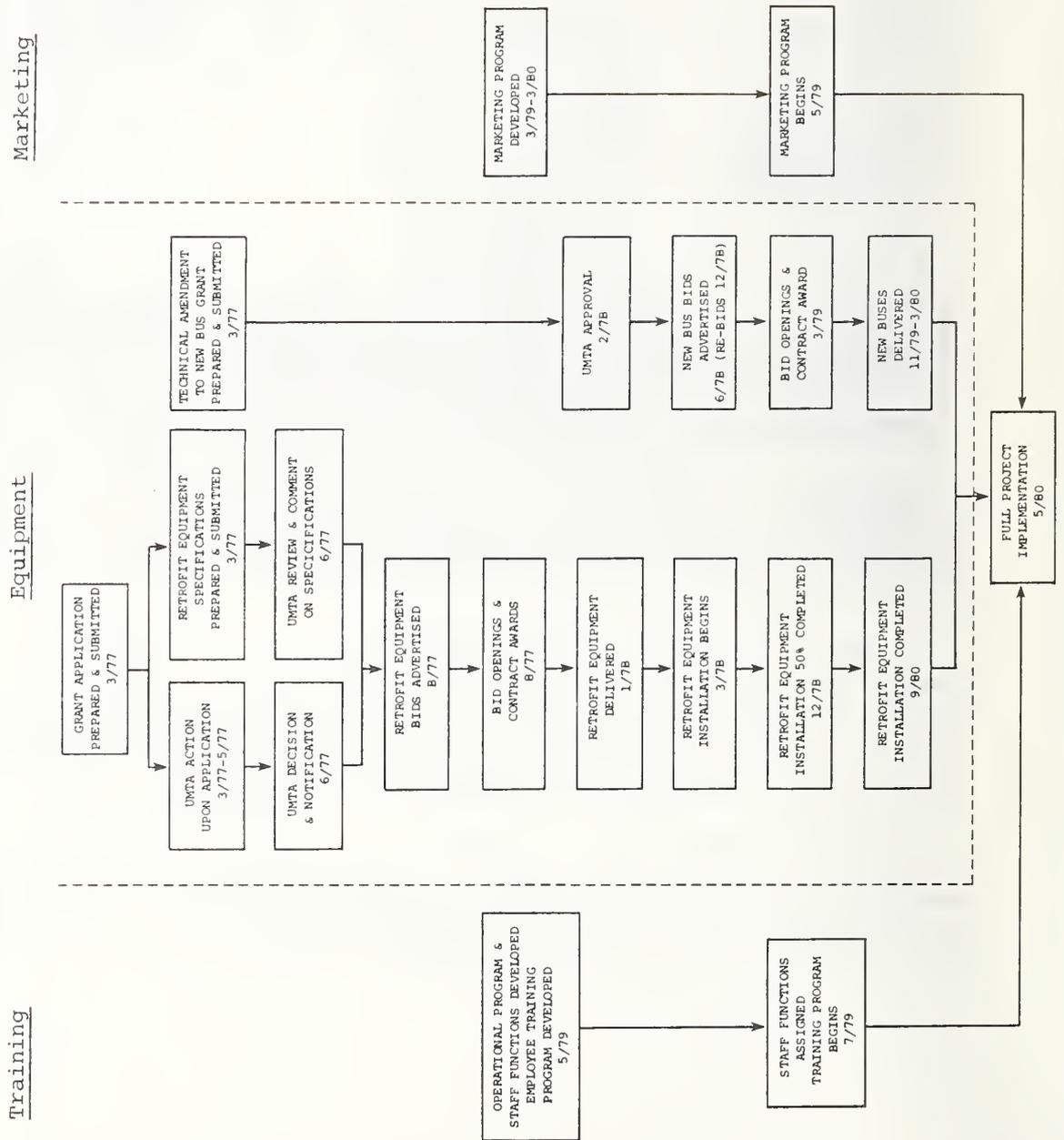
#### 3.3.1 Service Changes

In addition to adding special equipment to the CoTran fleet, some changes in services were expected to be required to accommodate the handicapped. These changes were to include: bus stop changes, bus route changes, shelters, fare policy changes, and passenger count procedures. In practice, only some of these changes took place.

CoTran did not move any bus stops on routes to accommodate the handicapped. It did, however, add a few bus stops for this purpose when an organization or individual requested it. In some areas of the county, bus stops are not designated; passengers can hail a vehicle anywhere along the route. However, in West Palm Beach, Riviera Beach and Lake Worth, designated stops are prevalent. CoTran has a two block rule for spacing bus stops.

Twenty shelters were purchased for installation at major bus stops throughout the county. About 60% of the shelters were to be installed in West Palm Beach, many of the remainder in the South County area. Obtaining municipal engineers' approval was a time consuming process, and as of the end of the demonstration, only six shelters had been installed.

Figure 3-4  
IMPLEMENTATION SCHEDULE



Reduced fare identification cards (like those issued to the elderly) were issued to handicapped users, to entitle the bearer to half fare. Drivers were required to record boardings by holders of such cards on their manual counters. Lift use was recorded on a revised driver card. Drivers listed the times and locations of boarding and alighting, the weather conditions and whether the person was in a wheelchair.

### 3.3.2 Operating Policies

Drivers were responsible for cycling the lift before pulling out, and for insuring that the lift was never allowed to drag on the ground; they were required to call in to the dispatcher if the lift did not work en route. Drivers were instructed to stop and inform waiting wheelchair passengers if no tiedown location were available. Although they were not officially required to help lift passengers, they were asked to provide assistance when necessary. In practice, drivers often prepare the tiedown location for a wheelchair passenger and sometimes help to pull the wheelchair onto the lift.

An instruction sheet outlining lift procedures was prepared by the Safety and Training Supervisor and was distributed to drivers (see Appendix A). Procedures which were in effect in May 1980 included:

- Only wheelchair users were to use the lift. The rationale behind the limitation on use of the lift by ambulatory disabled was the anticipation that large numbers of elderly residents would request to use the lift. However, since the buses did not have a kneeling feature and since passengers using crutches and braces had requested to use the lift, CoTran later decided to modify its policy. The number of ambulatory users never grew to any significant number.
- Wheelchair-users were to be last getting on and off.
- Wheelchair passengers were to board backwards.
- If the lift were inoperable, the dispatcher was to be called. The trip would be denied and noted on the driver card. When possible a bus change-up (substitution) was to be made.
- If a person were stuck on the lift, the dispatcher was to be called and a supervisor would come to help.
- Able-bodied passengers were to give up the wheelchair location.\*
- If the wheelchair position were occupied, the other trip would be denied and noted on a driver card. The waiting passenger was to be so informed.

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\* Police help was necessary when one passenger refused to give up the special seat. At the present time, not all the wheelchair seats are marked as such, and no elderly/handicapped priority seating policy exists.

- If the wheelchair would not lock into the tiedown clamp and the person were not transferable (to a regular seat), he/she would have to get off the bus. A note was to be made on the driver card. (This was later amended to permit wheelchair users to travel on the lift-bus if they could use the seat belt restraint.)
- Drivers were to help passengers if asked.
- If there were any problem with the user, the dispatcher was to be called.
- In an emergency, the wheelchair person was to be taken off the bus first.

### 3.3.3 Labor and Staffing Issues

The demonstration project was designed to operate without additional staff. During normal operations, drivers were not required to work any additional hours as a result of the demonstration. No additional drivers were needed; however, one additional mechanic was needed once contracted lift maintenance was discontinued. Marketing was carried out by the regular marketing contractor. Data collection required special staff at times during the demonstration; these workers were obtained as needed.

### 3.3.4 Media Coverage and Public Relations

The local press provided a good deal of coverage of the demonstration implementation. CoTran's marketing contractor provided frequent news releases on all aspects of the project. As a result, the local disabled and able-bodied communities were kept informed about the progress of the accessible service.

In general, local coverage was favorable in describing the improvements to the system as a whole and those specifically designed for the elderly and disabled user. The first negative coverage of the project appeared in June 1980, about two months after service was in full operation. Articles criticized the expenditure of funds on lifts that would not be usable by many disabled users of motorized wheelchairs.\* Among the other points the article raised were:

- Handicapped groups were not consulted, even after offering assistance as early as 1976;
- CoTran could have opted for another lift design in its purchase of the 40 new buses;
- CoTran believes that transportation for the disabled should be done by "alternative means";
- Palm Beach County served as the federal government's "guinea pig"; and
- The project began before a federally-funded study of the transportation needs of elderly and handicapped residents.

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\* Susan Sachs, "Disabled are Disappointed in Bus Aids" and "Handicapped Just Laugh At Bus Slogan", The Miami Herald, Sunday, June 29, 1980, p. 1B.

Although CoTran's and UMTA's responses to the questions raised by the local handicapped community were reported as well, the article may have significantly impacted the local view of the project. It is important to point out, however, that disabled individuals who use manual wheelchairs would be unlikely to be seriously discouraged from using the system by this article.

### 3.4 POST-DEMONSTRATION ACTIVITIES

At the end of the demonstration, the Board of County Commissioners voted to continue fixed-route accessible service with the provision that the cost be limited to the required 3½% of Section 5 funds.\* In accordance with this policy, CoTran purchased 8 lift-equipped Grumman advanced design buses (ADB). (These buses will include a kneeling feature, unlike the TMC bus). The ADB's will be utilized on Route 1, the major coastal route. With 12 additional lift-equipped buses to be ordered later in 1982, CoTran will have a total fleet of 79 lift-equipped buses.

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\* As per the interim Section 504 regulation issued by the U.S. Department of Transportation in July 1981.



# 4: EQUIPMENT CHARACTERISTICS

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In the past, operators of transit service for the handicapped have found lift equipment to be subject to frequent breakdowns. Such malfunctioning impacts the operator's ability to serve the disabled population and the reliability of service offered able-bodied passengers, as well as the cost of making transit service accessible.

Repair and maintenance data, driver and mechanic evaluations, and user attitudes and suggestions regarding the equipment were used in evaluating the lift device and other bus modifications required to improve accessibility for the handicapped on the fixed-route bus system.

## 4.1 DESCRIPTION OF LIFT-BUS FEATURES

In order to serve wheelchair-confined passengers, two major modifications were necessary to both existing buses and new buses: (1) lift devices for boarding and alighting and (2) special flip-up seats and wheelchair securement arrangements. These are described below.

### 4.1.1 The Lifts

#### Lift Selection

The lift installed on CoTran's new and retrofitted buses was the Electro-Hydraulic Handicap Lift (model G-30) produced by Transportation Design and Technology, Inc. (TDT) of San Diego, California. PBCTA had reviewed available lift devices and found most to be unsuitable, some designs requiring major alterations to both the lift device and bus structure. PBCTA chose to specify a mechanical/hydraulic system over a totally hydraulic one; specifications also included an auxiliary hand pump for use in the event of main system failure. The lift specifications as developed for procurement of bids are shown in Appendix C.

Several other issues arose in selecting lift-equipment, including whether the lift should be at the front door or rear door and the necessary dimensions to accommodate the various types of wheelchairs. Discussions with local prospective patrons indicated that the majority did not want "to be handled (in a way) significantly different than any other user of the system service". Thus, PBCTA proposed to obtain equipment which would allow wheelchair users to enter and exit at the front door and travel facing forward.

The issue of necessary door width to accommodate wheelchairs was discussed in PBCTA's grant application. PBCTA concluded that "a maximum thirty-four inch (34") to thirty-five inch (35") clear door opening is required." Unfortunately, the length of the platform received less attention in the preparation of specifications, yet it proved to be a much greater problem. As noted above, only a 40-inch usable platform length was provided, while most wheelchairs are 43-inches long (and the individual's feet may extend even farther).\*

#### Lift Operation

The lift is controlled by the driver from a control panel located on the dashboard (see Figure 4-1). In its stowed position, the lift acts as the normal step entrance to the transit vehicle (see Figure 4-2). Hinges connect the upper and lower steps with a riser; when lowered, the steps and riser form a single flat 36-inch platform. An additional 3 1/3-inch section of platform then extends from the end of the lower step including an angled ramp. When the lift is in motion, a safety gate folds up from the edge of the platform to prevent the wheelchair from rolling off. Built-in safety interlocks prevent operation of the lift when the safety gate is down. Sensitive edges and plates (on the underside of the lift platform) shut off the lift when it strikes an object on the ground (see Figure 4-3). This prevents damage to the lift as well as to passengers.

#### Effects of Lift Installation

Since installation of the lift also required raising the bus suspension, the first step became more difficult for ambulatory passengers. Neither the retrofitted nor the new buses are equipped with kneeling devices. Thus, ambulatory passengers who have difficulty climbing the high first step may be more inclined to use the lift than in other transit systems which offer both features.

In addition, the structural integrity of the older GMC buses was affected by the installation of the lift as it was necessary to cut the bus frame, making these buses more vulnerable to damages from accidents.

#### The Lift-Equipped Fleet

Originally, thirty older General Motors (GMC) buses were to be retrofitted with lifts; however, as a result of the purchase of new buses and the retirement of several older vehicles, only twenty-three of the older GMC buses were retrofitted. An additional forty TMC City Cruiser buses with factory-installed TDT lift devices were purchased.

The forty new TMC buses are 96 inches wide and 31 feet long, with a 42 inch-wide aisle between the front seats. The GMC buses are also 96 inches wide, but are 40 feet long. The extra length of the older buses allows more space for the wheelchair securement position.

The first retrofitting took place in March 1978. Retrofitting was completed in September 1980. The new buses began to arrive at CoTran in November 1979; all forty were available on the property by March 1980.

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\* Telephone conversation with Keith Rodaway, Ernest & Jennings, Inc.

Figure 4-1

LIFT CONTROL CONSOLE

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Figure 4-2

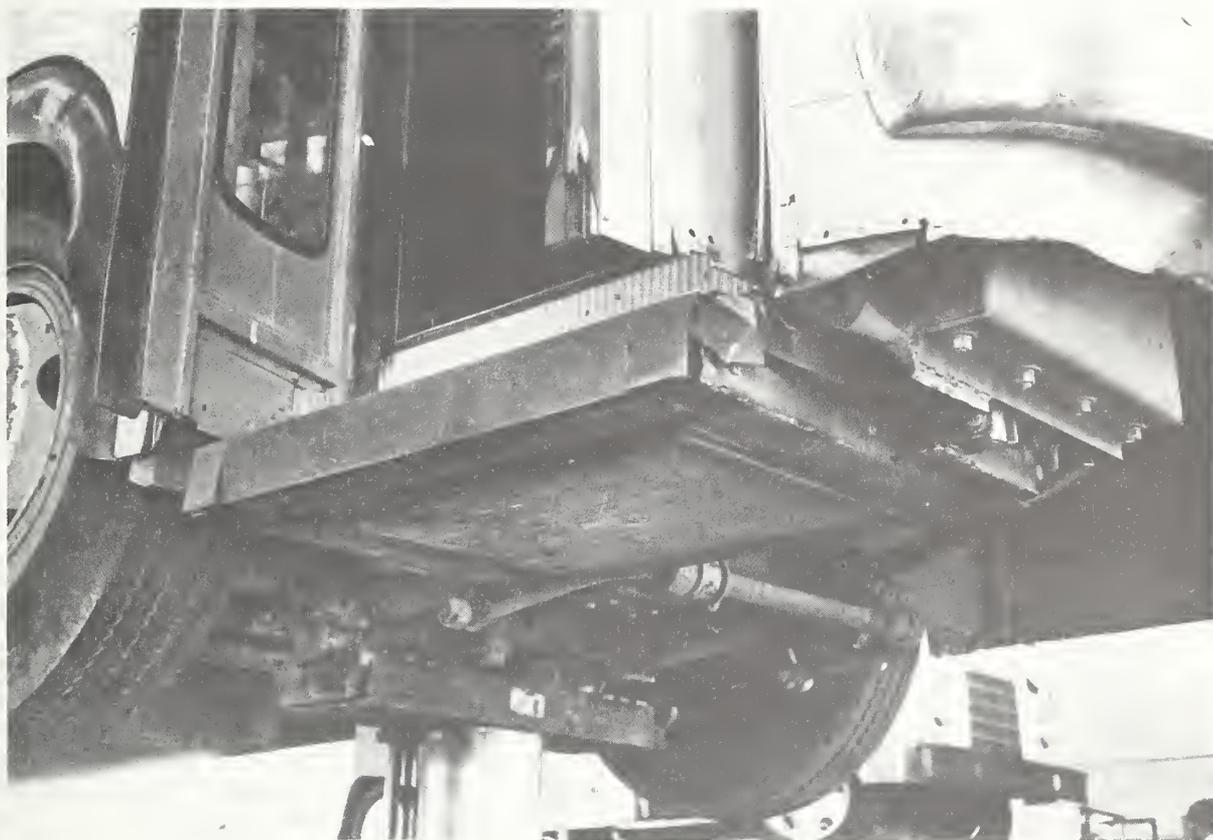
ACTIVATION OF THE LIFT



Figure 4-3

UNDERSIDE OF THE LIFT PLATFORM

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#### 4.1.2 Tiedown Arrangements and Other Modifications

In addition to installing lift devices, other modifications were made to enable the buses to accommodate wheelchair passengers, including tiedown devices to secure wheelchairs on the bus. As provided for in the UMTA demonstration grant, sixty-six transverse two-passenger flip-up seats with accommodation for wheelchairs were purchased in late 1977. Two such seats were installed in each retrofitted bus; in the smaller new buses only one seat was provided (see Figure 4-4). These seats fold up when the space is needed for wheelchair passengers, so that a wheelchair may be fastened in place of the regular seats (see Figure 4-5). The retrofitted buses lost six seats as a result of the installation of the special seats. When both wheelchair locations are used by disabled passengers, an additional four seating locations are lost. No seats were sacrificed on the new smaller buses but when the wheelchair location is occupied, two seating positions are lost.

The tiedown locking device requires only that the wheelchair back into the seat posts automatically causing the device to engage the wheelchair. The lock can then be released by the passenger or the driver (see Figure 4-6). After the first bus was retrofitted, it was evident that stronger clamps were needed. All buses have since been provided with clamps which will resist 500 lbs. of pressure. Since the clamps are not very easy to open or release, drivers have been instructed to help wheelchair passengers. A safety belt is also provided to insure that the passenger will not be subject to movement in the event of sudden bus movements or turns. It was hoped that most passengers would not require assistance to fasten safety belts; however passengers often required help to reach the safety belt.

At the suggestion of the Barrier Free Design Committee, grab rails were provided to increase the security of the wheelchair user when riding on the lift. The retrofitted buses have two short angled grab rails on the doors while the TMC buses have a long vertical railing in the stepwell area. However, in both cases the grab rails are stationary (i.e., they do not move up or down with the lift) and thus are not very suitable for the passenger who is riding the lift. Finally, shelters which have been purchased for installation at various locations in the county also have special accommodations for wheelchairs (i.e., wider doorways, extra space).

## 4.2 EQUIPMENT PROBLEMS

Almost every problem noted by Seattle Metro\* in their evaluation of the TDT-3 lift\*\* has been experienced in Palm Beach. Among the most significant problems have been:

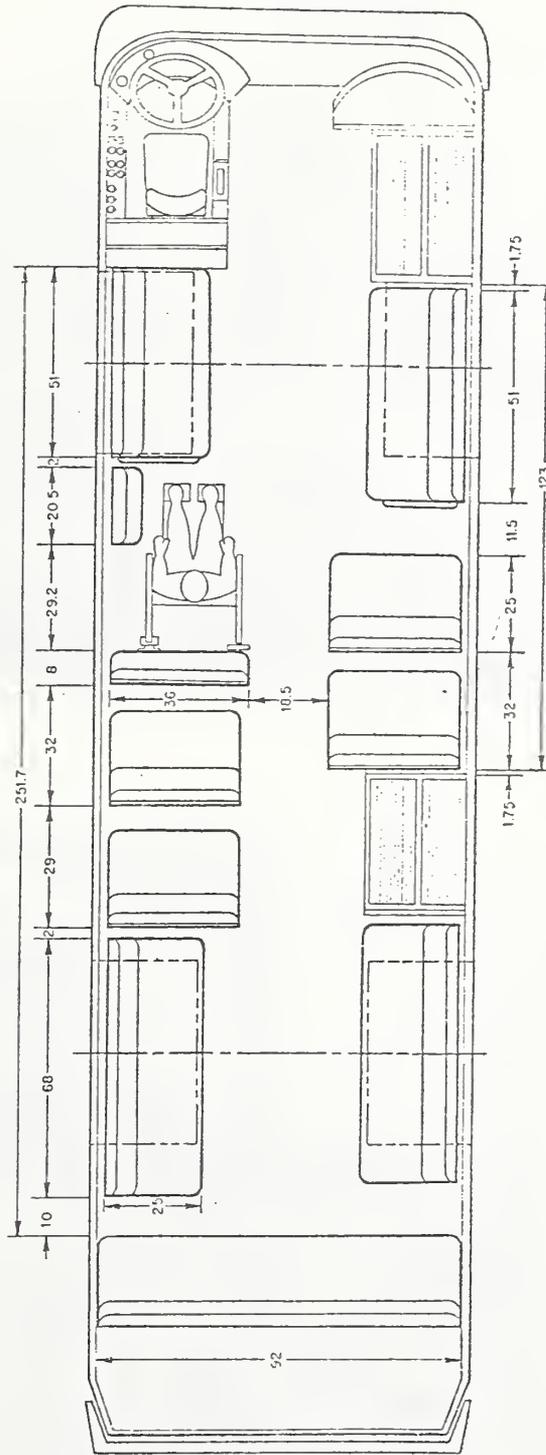
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\* The Municipality of Metropolitan Seattle, Evaluation Report on Five Wheelchair Lift Options for Installation in Transit Coaches, January 1979.

\*\* The new TDT G-50 lift reflects a total redesign of the G-30 (TDT-3) lift, which TDT considers a prototype design. The G-50 offers a reduced number of hydraulic cylinders and parts, a longer lift platform, an improved ramp angle, a higher safety gate, and a permanent grab rail. Consequently, the reader should not construe any of the reported difficulties with the G-30 lift to represent potential problems with TDT's current model.

Figure 4-4

TMC SEATING LAYOUT



30 PASSENGER WITHOUT WHEELCHAIR  
28 PASSENGER WITH WHEELCHAIR

AMERICAN SEATING  
REFERENCE DRAWING 2  
TL-10342

Source: CoTran

Figure 4-5

OPERATION OF THE FLIP-UP SEATS

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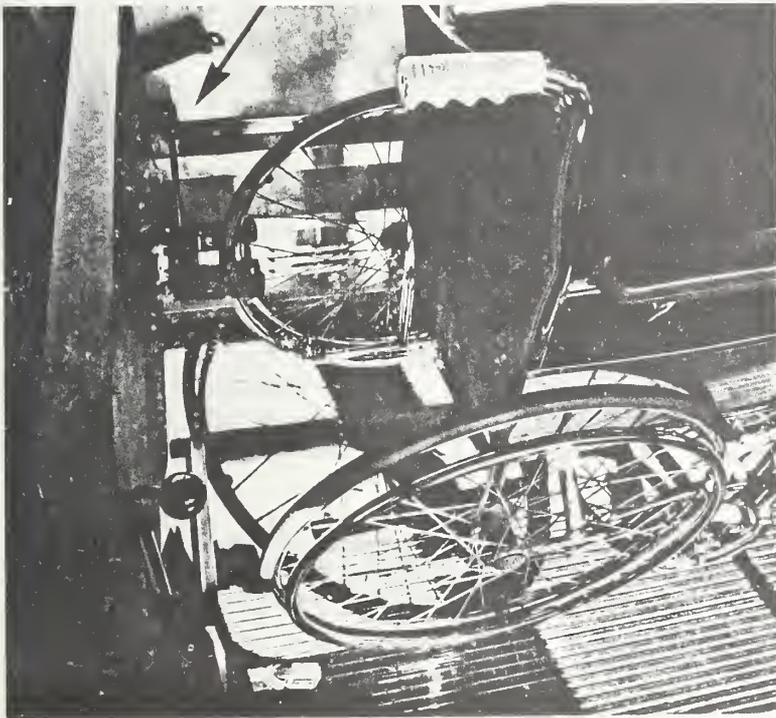


Figure 4-6

USE OF THE WHEELCHAIR TIEDOWN DEVICE



Wheelchair Securement Clamp



Source: Fred A. Fetterly & Associates

1. Lift drifting and leaking check valves
2. Ramp and sensitive edge design defects

Drifting involves downward movement from the fixed position as a result of uneven hydraulic pressure. This causes the steps to be in an abnormal position. The drifting problem was addressed by the addition of accumulator devices which maintain hydraulic pressure in the cylinders above and below the piston. Nevertheless, drifting continued, sometimes causing steps to slope from side to side. Part of the drifting problem was caused by leaking check valves, particularly on the new buses. This was due to contamination of the fluid lines, either during installation or production, which was not controlled by the filters included in the system. Flushing the system was required to solve the problem.

The edge of the ramp, as it was originally designed, was found to be difficult for wheelchair users to traverse. Replacement with a new edge solved this problem. The edges also serve as sensitive devices to shut off lift operation when they strike an object. The sensitive devices on the two types of buses are different. On most of the retrofitted buses the sensitive edge is an electrically-powered switch. When the edge strikes the ground or foreign object, an electric circuit is closed. The TMC buses have an updated version of the lift which has an air-pressure sensitive switch. Both act as grounds, although the air tube model shuts the lift down if there is some blockage in the tube. CoTran has found both designs to be problematic.

Among the other problems CoTran experienced are:

1. Lifts sometimes stow improperly with the steps in a higher than normal position.
2. Lifts occasionally rise and lower unevenly so that one side of the platform may be off the ground. (This can be dealt with by tuning the hydraulic components of the lifts.)
3. Where there is no curb and the street is banked, the edge of the lift is not always flush to the ground, creating difficulty for passengers.
4. Built-in safety mechanisms have malfunctioned so that accidents could have occurred (e.g., interlocks have failed to prevent lift movement with the safety flap down).
5. The hydraulic lines located behind the driver's seat on the TMC buses (the GMC buses have a different design) have leaked, creating a slick surface on the surrounding floor. Seattle Metro noted that this could cause passengers to slip and fall, or the driver's foot to slip off the brake. PBCTA has not reported any accidents attributable to this problem.

Probably the most significant equipment issue to arise during the project was the length of the lift platform. The TDT-3 (G-30) lifts installed on both the retrofitted and new CoTran buses have a platform length of 39.3 inches (measured to the hinge of endgate). This distance is insufficient for several types of wheelchairs, including many power wheelchairs. Note that a recent

study\* identified the 90th percentile chair's length as 42.5 inches and suggested that an additional 2.5 inches are needed for normal extension of the feet beyond the footrest. The local handicapped community expressed dissatisfaction with both the lift design and even more emphatically with the marketing program which, despite the limitations of the lift design, characterized the service as "fully accessible to the elderly and handicapped" (intended to refer to the accessibility of the entire CoTran fleet).

While CoTran did contact TDT to investigate whether the lift platform could be adapted to increase the clearance (it could not), the Barrier Free Design Committee perceived the overall attitude of the authority toward the problem to be one of indifference. CoTran made little effort that was apparent to the public to make the system more accessible or to consult with the handicapped community on purchases of additional equipment, but agreed to cease using the term "fully accessible" in subsequent advertising.

Although a Veteran's Administration report issued in June 1977 recommended a minimum lift platform length of 52 inches\*\*, CoTran's lift specifications required a platform length of only 36 inches. Greater consultation with handicapped and rehabilitation groups at the outset would have helped to identify the inadequacy of a 36-inch platform before all the lifts had been purchased and installed. Note that TDT's new G-50 lift (which became available in the summer of 1980) has a platform with 50-inches of clearance. However, TDT's G-30 lift was the only front-door lift in production in mid-1977 when CoTran selected its lifts. Although CoTran had an opportunity to select different lifts when it purchased the 40 new buses (since it re-issued its request for bids and awarded the contract in 1979), the controversy over lift platform length did not occur until later. In any case, only particular lifts were offered with any given bus; TMC installed only TDT lifts. Thus, unless CoTran were to re-write the specifications for the re-bid to exclude lifts of inadequate platform length, it could not have requested substitution of a different lift nor could it reject a bid for this reason.

CoTran management believes that the lift that was purchased was the best available at the time. Nevertheless, CoTran is not convinced that the lift should have been purchased to meet improved specifications even if they were available, since it believes that the primary consideration in ordering new buses should be the bus and not the lift. CoTran feels it is sufficient that the lift accommodated most manual wheelchairs and some smaller-size power wheelchairs, and feels that is consistent with its accessibility program to serve passengers in wheelchairs (not necessarily wheelchairs of all types).

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\* Mark S. Sanders, Ph.D., A Requirements Analysis Document for Transit Vehicle Wheelchair Lift Devices, Prepared for the Urban Mass Transportation Administration by Canyon Research Group, Inc., UMTA-CA-06-0101-79-1, June 1978.

\*\* Veterans Administration, VA Standard Design and Test Criteria for Safety and Quality of Automatic Wheelchair Lift Systems for Passenger Motor Vehicles, VAPC-A-7708-3, New York: VA Prosthetics Center, June 1977.

The Barrier Free Design Committee feels that power-chair users should be provided with accessibility. Power wheelchairs have been estimated to consist of only 5% of wheelchair sales, although the percentage is growing and may soon reach 10%.\* The correlation between sales of different wheelchairs and users is not really known, although it is believed that a higher percentage of potential bus users are likely to be power wheelchair-users due to a) the greater ability of power wheelchair users to access the bus stop; and b) the fact that many of the manual chairs sold are used in institutions or for occasional use as spares. Many active wheelchair users are now using power chairs. In fact, in Seattle which has a large lift ridership about 50% of lift-users use power chairs. The non-user survey conducted in Palm Beach County indicated that 45% of wheelchair users use power chairs. Whether Section 504 required accessibility to all types of wheelchairs is unclear; however, purchase of lifts which were not accessible to many power wheelchair users certainly created ill-will between the transit authority and the only local organization of disabled people.

Another equipment-related issue which detracted from the accessibility of the system was the nature of the tiedown devices. Aside from their placement (too close to the bus sidewall) which could be, and was reportedly remedied later in the demonstration, the devices (which clamp on the wheel) are not easy to use and cannot be used at all with some types of chair (e.g., power chairs, Amigo chairs). As a result, Amigo chair users were initially denied service; in fact, one such incident was covered on the local television news. Since that time, CoTran management has agreed to allow anyone to ride the bus who can at least use the seat belt. Thus CoTran has eliminated an earlier policy which posed an obstacle to use of the bus by those in Amigo chairs. Passengers who cannot use either restraining device are not permitted to ride, for safety reasons.

CoTran management believes that the state-of-the-art has improved since CoTran purchased its TDT model G-30 and updated G-30 lifts. While many of CoTran's problems can be attributed to limitations in the state-of-the-art of lift technology at the time (a problem which other authorities now purchasing lifts should not encounter), some problems can be traced to other factors. These factors relate to inadequate supervision by CoTran staff of lift installation and lack of specific acceptance tests.

## 4.3 EQUIPMENT INSTALLATION, MAINTENANCE AND REPAIR

### 4.3.1 Description of Participants

There were a number of key participants in the production, installation, maintenance and repair of CoTran's TDT lifts -- CoTran, Transportation Design and Technology, Inc. (TDT), Transportation Manufacturing Corporation (TMC) and Transportation Modification Systems, Inc. (TMS).

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\* Telephone Conversation with Keith Rodaway, Everest & Jennings, Inc. and N.R. Kleinfield, "Wheelchair Maker vs. Critics", The New York Times, February 12, 1981, p. D1.

CoTran, the operator of Palm Beach County Transportation Authority services, was the purchaser and operator of the lift-buses and was (ultimately) responsible for their maintenance. TDT manufactured the lift.\* TMC, the manufacturer of CoTran's 40 new buses was the installer of the lifts on its buses. TMS (and its predecessor) was responsible for retrofitting of lifts in older buses, installation of special flip-up seats and grab-rails, repositioning of coin boxes, installation of accumulator packages, new sensitive edges, etc. (TMS was a spin-off firm of the original contractor retrofitting CoTran's older GMC buses, and its staff included the former contractor's staff who worked on the lift.) TMS was also responsible during a portion of the demonstration period for maintenance of the lifts under contract to CoTran, and served as the local TDT representative.

#### 4.3.2 Acceptance Testing

No formal acceptance testing of the lifts was carried out by CoTran. Instead, CoTran furnished the bus manufacturer (TMC) with a "testing sheet" to be used at the factory. CoTran did not maintain total supervision over acceptance testing. Upon delivery, the buses and lifts were "looked over" by CoTran mechanics who noted any defects on an "acceptance sheet." Some lifts were found to have leaks in the hydraulic system. CoTran believes that some lift problems derive from faulty installation practices at TMC. In retrospect, CoTran management believes a greater CoTran supervisory role at the factory was needed. It is also believed that TDT should have played a greater role in the installation process than TMC permitted.

About halfway through the TMC order of 40 buses, a change was made in the production process: lifts were installed on the production line, instead of in the "test shop", thus permitting TMC to insure proper lift installation and operation before delivery. As a result of this change, noticeable improvements in quality control were brought about.

#### 4.3.3 Maintenance

CoTran contracted with TMS for inspections, routine and preventive maintenance and minor repairs at a cost of \$50.00 per month per bus. This work included steam cleaning, lubrication and tuning of hydraulic flow controls (see Figure 4-7). Major repairs were performed at additional cost (\$25.00 per hour). The routine work was performed at CoTran's facilities at night.

Cotran's regular maintenance staff consisted of seventeen mechanics and thirteen utility people for most of the demonstration period. All mechanics were trained to do simple lift inspections and preventive maintenance. Only three were able to do lift repair work. Eventually, all 8 class "A" mechanics were trained to do lift repair work as well.

CoTran's drivers were responsible for daily cycling of the lifts and for recording any apparent defects on a repair card. Any minor repairs were then done in-house; major repairs were referred to TMS.

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\* TDT rather than TMC warrants the lift, but covers only defective parts for 1 year (no labor costs). Nevertheless, TDT agreed to pay for some repairs necessary to correct hydraulic leaks.

Figure 4-7

LIFT MAINTENANCE SCHEDULE



TELEPHONE 588-1779

TRANSPORTATION MODIFICATION SYSTEMS, INC.  
719 WHITNEY AVENUE  
LANTANA, FLORIDA 33462

LIFT SERVICE PROCEDURE

<u>Bus No.</u>	<u>Lift No.</u>	<u>Mileage</u>	<u>Date</u>
----------------	-----------------	----------------	-------------

Initial

- |       |    |   |  |
|-------|----|---|--|
| _____ | 1. | Clean hydraulic reservoir, module, accumulator & steps.   |  |
| _____ | 2. | With bus running & lift in stow position, check following:  |  |
| _____ | A. | Fluid level in reservoir sight glass.   |  |
| _____ | B. | All hoses & connections for fluid leaks.  |  |
| _____ | 3. | Cycle lift from main control panel at least two times & check the following:  |  |
| _____ | A. | Check electrical system for proper illumination of all electrical switches for proper operation.                        |  |
| _____ | B. | With lift in down position & ramp deployed, check for chatter & check sensitive edge device for proper operation.       |  |
| _____ | C. | Check that safety door operates properly.   |  |
| _____ | D. | Raise & lower lift to determine if cylinders are properly tuned & check that floor level switch is positioned properly. |  |
| _____ | E. | Stow lift to normal operation position & check stow switch height from above & below.                                   |  |
| _____ | 4. | Operate lift from outside control panel at least one complete cycle.  |  |
| _____ | 5. | Check accumulator pressure (175 lbs) & adjust as necessary.   |  |
| _____ | 6. | Grease bearings on ramp & rear slider panel & rollers on cylinder guides.   |  |
| _____ | 7. | Clean closeout panels & touchup paint as necessary.   |  |

REMARKS: (To include any damage or malfunction of system components and recommended repairs.)

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In January 1981, TMS ceased operations and CoTran took over full responsibility for lift maintenance. Two CoTran mechanics received a total of thirty person-hours of training from TMS so that the transition could take place. This shift to in-house maintenance has been most beneficial to CoTran, increasing lift availability and decreasing lift maintenance and repair costs. For example, the cost of repair and maintenance (excluding parts) was reduced from \$3058 in September 1980 to \$1147 in March 1981. While part of this reduction can be attributed to the lower hourly cost of CoTran mechanics (\$9.10 vs. \$25 per hour), CoTran has also cut the frequency of preventive maintenance (PM) procedures in half, at apparently no detriment to service. (Lift inspections are now performed at 8000 mile intervals instead of 4000 mile intervals; this corresponds to every other bus inspection.) It is probably too soon, however, to determine the long-term effects of the change in preventive maintenance procedures.

CoTran's Maintenance Superintendent believes that contracting was a good idea at the start of service, since it allowed time to bring mechanics "up to speed" with the new equipment and insured reliable service to riders at the critical service initiation period. This is particularly important in CoTran's case, since CoTran was understaffed and had to phase in new buses as well as lifts. Nevertheless, it is still apparent that CoTran was spending an excessive amount in the first year of the project by not performing maintenance in-house, particularly since its in-house costs are so low. While the above suggests that other transit properties implementing similar service with similar equipment could expect to experience somewhat lower costs if they perform maintenance in-house, other transit properties may have higher wage rates.

#### 4.3.4 Lift Repairs

CoTran kept detailed records of repairs to lifts during the project period, separately reporting data on the retrofitted and factory-installed lift-buses. During the year beginning in August 1980, an average of 6.5 (one out of every four) retrofitted GMC buses underwent lift repairs each month compared to 8.2 (one out of every five) TMC buses. Thus, the average number of malfunctions per bus per year was 3.39 on GMC buses and 2.45 on TMC buses. Table 4.1 shows the repair rate by type of repair. Note that while the most common problem on the retrofitted GMC buses was hydraulic leaks, electrical problems predominated on the TMC buses. The incidence of electrical switch problems on the GMC buses was reduced by the replacement of original toggle switches on the console with a similar switch of different manufacture. The switches on the TMC buses are now being replaced as well.

An average of fifty mechanic-hours per month (or just over one mechanic-week) were spent on lift repairs. This represents 3.5% of total bus repair hours. Lift repair hours fluctuated from month to month over the course of the project, with no apparent trend. On average, the retrofitted buses required over twice as much repair time -- 1.9 repair hours per bus per month compared to 0.7 repair hours for the new TMC buses, despite the fact that the same basic TDT G-30 lifts were used on both types of vehicles. CoTran believes several factors are responsible for this difference including the difference between factory installation and retrofitting and the greater degree of vibration and stress on the longer GMC buses.

Table 4.1

## NATURE OF LIFT REPAIRS (AUGUST 1980 - JULY 1981)

Type	Malfunctions/Bus/Year		
	Retrofitted GMC Buses (23)	New TMC Buses (40)	Average (63)
Electrical/Switches	0.56	0.85	0.75
Adjustment/Tuning	0.52	0.35	0.41
Hydraulic Lines/Leaks	1.04	0.03	0.40
Kinked Air Lines	0.04	0.45	0.30
Rollers	0.43	0.15	0.25
Check Valves	0.13	0.25	0.21
Tower	0.26	0.10	0.16
Accidental Damages	0.22	0.10	0.14
Accumulator	0.13	0.13	0.13
Ramp Tracks/Slides	0.22	0.05	0.11
Other Hydraulic System	0.22	0.05	0.11
Four-way valve	0.13	0.08	0.09
Sensitive Edge	0.09	0.03	0.05
Bulkhead	0.13	0	0.05
Control Relay	0	0.08	0.05
Other	0.17	0.08	0.11
Total*	3.39	2.45	5.84

\* The total reflects the number of buses in repair even if more than one type of repair was involved.

Since the end of the demonstration period, CoTran has reported a major problem with the retrofitted TMC buses; stress, believed to be caused by the removal of a support member during the retrofitting, has caused fracture of the bus frames.

#### 4.4 LIFT RELIABILITY

Several measures have been used in this evaluation to indicate the reliability of the lift equipment. These include: lift breakdowns (malfunctions of the lift at the garage and on the road); road breakdowns of the lift (involving dispatching of a repair crew); and "change-ups" (on-the-road substitutions) due to problems with the lift.

#### 4.4.1 Lift Breakdowns

CoTran reported the incidence of lift malfunctions each month since service was initiated with just three retrofitted GMC buses on the first route in October 1979. It should be noted that CoTran had fifteen to twenty retrofitted buses on the property and that all retrofitted vehicles were cycled and malfunctions were recorded. While initially only four to five malfunctions were reported each month, this number soon increased. In January 1981, twenty-four malfunctions were reported. By the time the service was to be expanded to all routes, however, malfunctions had been reduced below even the initial levels.

When service was initiated in May with a sixty vehicle fleet and a peak requirement of 54, thirty-nine malfunctions were recorded -- more than one per day. This was reduced fairly quickly and fifteen to twenty malfunctions (0.27 per bus) per month were more typical for the remainder of the project period.

Malfunctions most often involved either drifting of the lift from the stowed position or its complete failure to operate. (See Table 4.2). It was to remedy the drifting problem that CoTran purchased and installed "accumulator" devices on all lift-buses. These devices have ameliorated the problem but have not been completely successful. GMC buses averaged a total of 2.1 incidents of drifting per month or one for every ten buses; TMC buses averaged 2.5 incidents or one for every sixteen buses. Drifting was responsible for 27% of lift malfunctions on GMC buses and 25% of lift malfunctions on TMC buses. Although GMC buses appear to have more frequent problems with drifting, the different nature of the doors on the two types of buses influenced the degree to which drifting creates problems for the drivers. Thus, drivers of GMC buses may report the problem more frequently since drifting prevents them from operating the doors. Nevertheless, it is also believed that the factory-installed accumulator devices on the TMC buses have been operating more effectively to prevent drifting.

Incidents of the lift completely failing to operate averaged 4.2 per month for GMC buses and 6.3 per month for TMC buses, equivalent to one for every six and seven buses respectively. These problems accounted for 53% of lift malfunctions on GMC buses and 63% of lift malfunctions on TMC buses.

Drivers responding to a survey indicated that few had experienced frequent lift malfunctions. When asked if they viewed the lift as reliable, three quarters did.

#### 4.4.2 Road Breakdowns and Change-ups

The incidence of road breakdowns and change-ups indicates the impact of lift malfunctions on service operation as well as an additional burden placed on CoTran staff by the lift. Whether the response to a road call was the substitution of another bus (change-up) or the dispatching of a mechanic (road breakdown) reflects both the nature of the problem and some discretion on the part of the supervisor.

Road breakdowns over the course of the evaluation period have been rare, according to CoTran, most likely due to the fact that buses were rarely if ever immobilized and that spares were available. Thus, major service disruptions could be avoided by effecting a change-up of buses.

Table 4.2

## NATURE OF LIFT MALFUNCTIONS (AUGUST 1980 - JULY 1981)

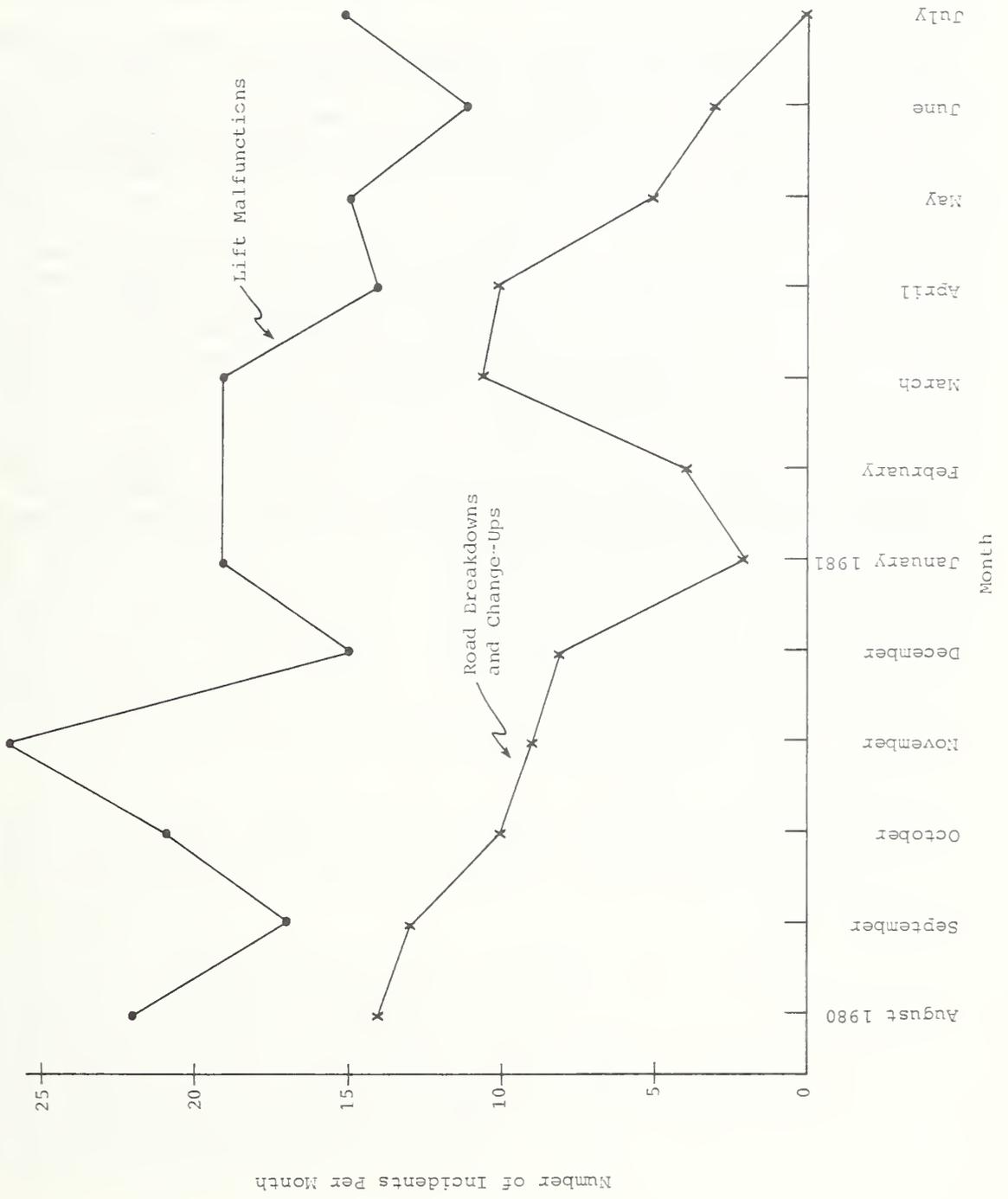
Type	Malfunctions/Bus					
	Retrofitted		New TMC Buses (40)		Average (63)	
	GMC Buses (23)					
	No.	%	No.	%	No.	%
Drifts	1.09	27	0.75	25	0.87	26
Does Not Operate	2.17	54	1.90	63	2.00	59
Stows Improperly	0.17	4	0.08	3	0.11	3
Erratic Operation	0.52	13	0.23	8	0.33	10
Interlock Fails	0	0	0.05	2	0.03	1
Other	0.09	2	0	0	0.03	1

CoTran reported one or two change-ups during each month of the single-route service period except in January when seven change-ups were required. The number of change-ups due to lift malfunctions further increased to fourteen when accessible service was introduced on all routes in May. A slight reduction in the incidence of change-ups occurred over the remaining months and the average for the period beginning in May 1980 and ending in July 1981 was 6.6 (see Figure 4-8). The need for change-ups has been greater on retrofitted buses, averaging 0.14 per bus per month compared to 0.06 per bus per month for TMC buses. The total number of road breakdowns and change-ups due to lift problems averaged 7.4 incidents per month and represented 8.6% of all road calls for any reason.

Among the reasons for changing-up a bus were drifting, failure of the lift to operate or retract, leaks, sensitive edge problems, lifts catching the doors, and damages to the lifts. CoTran has found that many road calls related to the lift stemmed from driver ignorance of the lift mechanism. (While drivers pulling out of the garage routinely cycle the lift, those who relieve other drivers during the afternoon do not do so.) Often the driver could be instructed over the radio on how to operate the lift so that a supervisor need not be dispatched. During the winter of 1981, CoTran carried out periodic checks of drivers as they would pull in to the garage to make sure that they knew how to operate the lift properly.

Drivers also often reported lifts to be inoperative at the last minute before leaving the garage hoping to avoid picking up disabled people on their run. Consequently, CoTran implemented a policy of not allowing buses to pull out without checking on these reports; this reportedly reduced the incidence of false trouble reports. However, it is difficult to discern any trend in the total number of road breakdowns and change-ups.

Figure 4-8  
LIFT RELIABILITY



## 4.5 SUMMARY

Although CoTran implemented its demonstration accessible service with an early model lift whose design was found to be lacking in several respects, the authority was able to maintain good levels of lift-bus availability at a reasonable level of effort. While drifting from the stowed position, hydraulic leaks and electrical and switch malfunctions detracted from the overall lift reliability; it was the basic design of the platform and tiedown device, and particularly their failure to adequately accommodate power-drive wheelchairs that were most problematic in relations with the handicapped community.

Initially CoTran had an outside contract for lift-bus maintenance. The cost of maintenance and repair decreased substantially after CoTran switched to in-house operations. This was due in part to the lower wage rate of CoTran employees, but was also attributable to a decrease in preventive maintenance which meant fewer total mechanic hours. The decrease in frequency of preventive maintenance procedures does not appear, as yet, to have had a detrimental impact on equipment reliability.

While the level of lift malfunctions has been relatively low, the older retrofitted GMC buses have had a greater frequency of repair than the newer buses with factory installed equipment. Several factors have contributed to this difference; however, in general, CoTran believes the factory-installed lifts to be more reliable. Furthermore, since the demonstration ended, CoTran has experienced problems with the bus frames on the retrofitted buses, resulting from the removal of the support member necessary to install the lift.

It is believed that with improved lift designs and factory installation, other properties should experience fewer difficulties than CoTran. It also appears that the cost of maintaining the equipment to insure service reliability can be kept to acceptable levels.

# 5: SERVICE QUALITY AND SUPPLY

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This section describes the changes in service availability for disabled people as a result of the introduction of lift-equipped buses on CoTran routes and discusses various aspects of the quality of service based on analysis of operating data and surveys of 20 users of the service and a comparable group of 60 non-users who utilize wheelchairs, walkers and/or braces. The survey population is discussed in detail in Section 6. Finally, any negative impacts on the service quality offered able-bodied CoTran riders is discussed. On-board surveys provided the basis for that analysis.

## 5.1 ACCESSIBLE SERVICE COVERAGE, FREQUENCY AND TRAVEL TIME

### 5.1.1 Coverage

The accessible bus project in Palm Beach County was designed to include the entire county transit service operated by PBCTA. The implementation of accessible service proceeded in stages. One route began operating with 3 lift-vehicles in late September 1979. (Note that PBCTA operated a total fleet of 50 vehicles in peak hour service). In May 1980, lift-buses were operating on all routes and the 100% accessible service truly came into being. Concurrently, major service changes unrelated to the lift went into effect and the peak requirement increased to 58. Since it was at this time that the demonstration of full fleet accessibility really began, the following description of CoTran service coverage pertains to the post-May 1980 period.

CoTran service operates on 20 routes as shown in Table 5.1. These routes provide inter-city service among most coastal communities and limited service to and from the "Glades area" in the western, agricultural region of the county. In addition, several routes operate circulator and crosstown service in each major municipality.

Most of the routes operate on major arterials, many of which are lined with substantial commercial developments including large shopping centers. Many residential developments in Palm Beach County are located off the major roads, particularly in some of the newer areas. Thus, for many residents, substantial walk distances are required to utilize the bus (see Figure 5-1). In West Palm Beach itself, buses do traverse residential neighborhoods; however, housing densities are so low that many residents would still have to walk substantial distances to get to the bus.

Table 5.1

## SERVICE CHARACTERISTICS (MAY 1980)

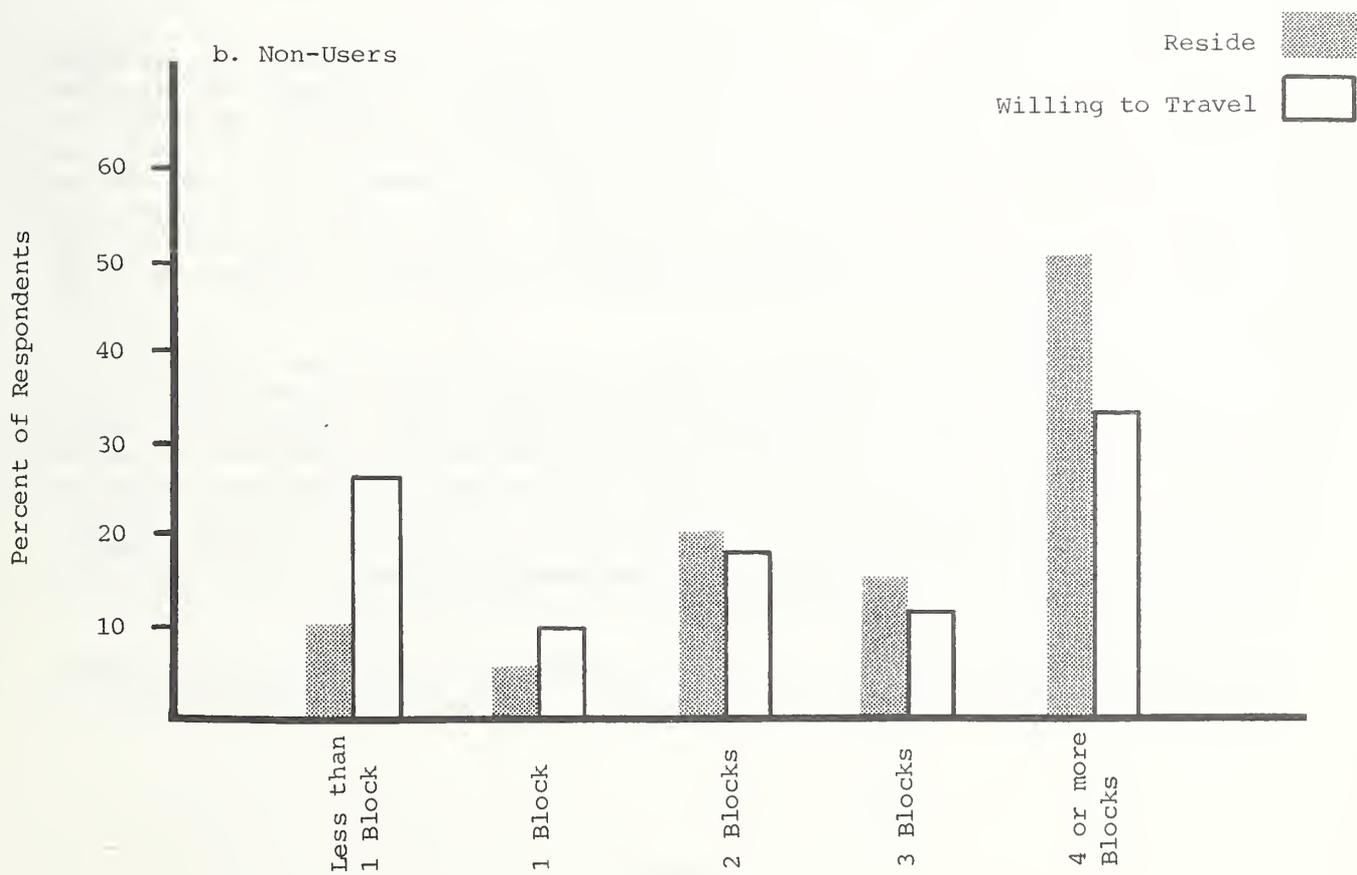
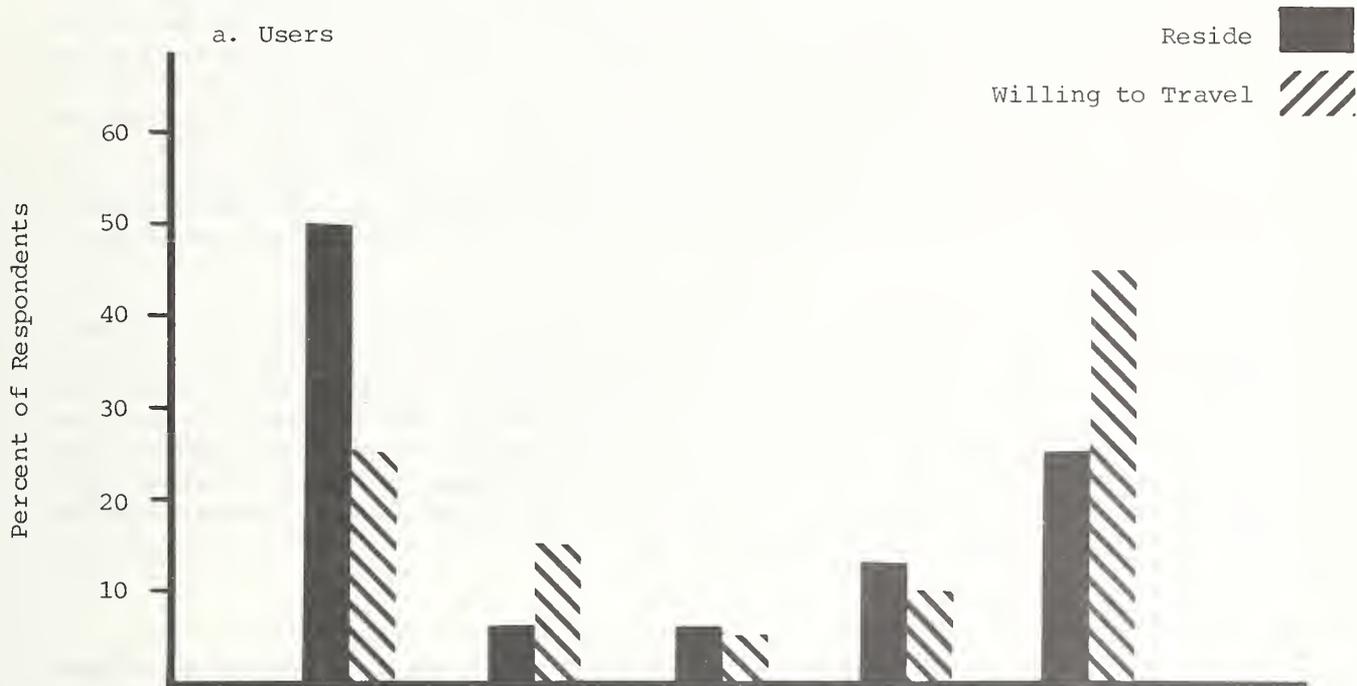
Route	Service Area	Weekday Service Hours	Weekday Frequency	Service Saturday/Sunday?
1S	South County (via U.S. 1)	12 hours	every hour	Yes
1	Central County (via U.S. 1)	15 hours	every 20 min.	Yes
1N	North County (via U.S. 1)	12 hours	every hour	Saturday
1T	North County - Tequesta	12 hours	every 45 min.	Yes
1J	North County - Jupiter	12 hours	every 45 min.	Yes
1P	Palm Beach Gardens	12 hours	every 45 min.	Yes
2	West Palm Beach-Lake Worth (via Lake Avenue)	13 hours	every hour	Yes
3	Lake Worth-WPB-Riv. Beach-Singer Is. (via Parker/Tamarind Ave.)	12 hours	every hour	Saturday
4	Crosstown West Palm Beach (via Okeechobee/P.B.L. Blvd.)	12 hours	every 30 min.	Yes
5	West Palm Beach-Palm Beach Crosstown (rush hours)	4 1/2 hours	every 45 min.	No
5A*	West Palm Beach-Palm Beach Shuttle	11 hours	every 20 min.	Yes
6	Crosstown Lake Worth	12 hours	every hour	Yes
7	Delray Beach	6-8 hours	every 30 min.	Yes
8	Boca Raton (via Glades Road)	9 hours	every hour**	Saturday
9	Crosstown Boynton Beach	12 hours	every hour	Yes
10	Glades-West Palm Beach	11 hours	2-5 trips/day	No
11	Glades (Pahokee-South Bay)	12 hours	5 trips/day	No
12	Boca Raton (N.W.-S.E.)	10 hours	every hours	Saturday
14	Boca Raton (via N.W., 2nd., U.S. 1, A1A)	rush hours	2 trips/day	No
20	Lake Worth-West Palm Beach via Military Trail	12 hours	every hour	Yes

\* This shuttle route was subsequently eliminated; instead Route 4 was extended to Palm Beach except for certain trips which operated as Route 4S.

\*\* Approximate; schedule varies.

Figure 5-1

DISTANCE FROM THE BUS STOP



### 5.1.2 Frequency

The majority of CoTran's routes operate infrequently with 45 minute to one hour headways. The more frequent routes include Route 1, which operates along U.S. 1 every 20 minutes in the central county area (West Palm Beach and environs); Route 4, which operates every half-hour crosstown between downtown West Palm Beach and the western shopping district (including the Mall), and Route 7, which operates crosstown in Delray Beach. Service operates approximately 12 hours a day, although on some routes there is service into the early evening hours. Many routes have service on weekends but operation is even less frequent.

CoTran's long headways mean that users must consult schedules and that a wheelchair user would be seriously inconvenienced if he/she were unable to board a bus due to an inoperable lift or an occupied wheelchair tiedown location. Although the Palm Beach County demonstration was designed to test the concept of full accessibility, the low frequency of service for the general public makes the level of service for disabled people rather similar to that in other communities with higher service frequencies for the general public but only partial accessibility.

### 5.1.3 Travel Times

Bus travel in Palm Beach County is much more time consuming than automobile travel, particularly since the area has excellent north-south highway service (on I-95) and many uncongested crosstown arterials on which buses do not travel. Bus travel times were examined for a few origin-destination pairs and were found to reflect overall speeds of 6-11 miles per hour.

## 5.2 PROJECT IMPACTS ON AREA ACCESSIBLE TRANSPORTATION SERVICE AVAILABILITY

The introduction of lift service on CoTran's routes has had a major impact on the quantity of transportation services available for disabled people. There is no other low cost lift-equipped bus service operating for disabled people under age 60 in Palm Beach County, and there are only two lift-equipped vans currently operating Title III transportation for senior citizens who need lift service. The project has increased the number of lift-equipped vehicles operating in public transportation service in the urbanized area from 12 (8 Medi-Car vehicles plus 4 agency vehicles) to 75, or more than 500%.

The effects on the quality of services available are more difficult to assess. While Cotran's scheduled service has some advantages over demand-responsive service in terms of trip flexibility (i.e., no advance notice required), its major disadvantage lies in the access trip. The need to travel to a bus stop and wait for the bus away from the home is made more onerous by the presence of various barriers such as curbs, traffic and inclement weather conditions. Depending on the nature and severity of the individual's disability, these factors may make the quality of service so low that the availability of the service is insignificant to some potential users.

For those who have no significant physical difficulty using the service, an important service quality issue is cost. A trip on CoTran costs 30¢ for

disabled travellers, while a trip on Medi-Car (the only general purpose wheelchair carrier for under-60 disabled) costs in excess of \$20. Thus, in this respect, CoTran lift service offers a major improvement.

### 5.3 PROBLEMS USING THE LIFT-BUS

Problems users had with the lift-buses were investigated in surveys; the survey procedure is discussed in Section 6.1. Figure 5-2 shows average user perceptions of various problems with the lift-bus (weighted according to the perceived seriousness of the problem).<sup>\*</sup> Users have had little difficulty with the lift or tiedown mechanism and on average rate the service as "good." The perceived problems most frequently reported were related to getting to and waiting for the bus (bad weather, lack of shelters and lack of curb cuts) followed by being denied entry to a vehicle due to an inoperable lift. Note that the former two are also common complaints of able-bodied riders. Neither fears about personal safety and security nor physical difficulties in using the lift were found to be major problems. Only about one-fifth to one-quarter of the users had serious problems with the tiedown devices, degree of driver assistance, fears about safety getting to the bus stop or buses not pulling up to the curb.

When questioned about barriers to their getting to the bus stop, lift-users noted curbs and major streets as the most serious problems. These were also the foremost problems perceived by non-users with the addition of rough street surfaces/lack of sidewalks.

### 5.4 LIFT-USER SERVICE RELIABILITY IMPACTS

One of the key level of service characteristics perceived by transit riders is service reliability. Typically, this means adherence to advertised schedules; that is,

- a vehicle is available at the time and location indicated;
- the travel time is within an acceptable tolerance of the advertised time.

For lift-users reliability has an added dimension. The vehicle must be equipped with a lift and a tiedown seating location, the lift must be operable and the seating location available.

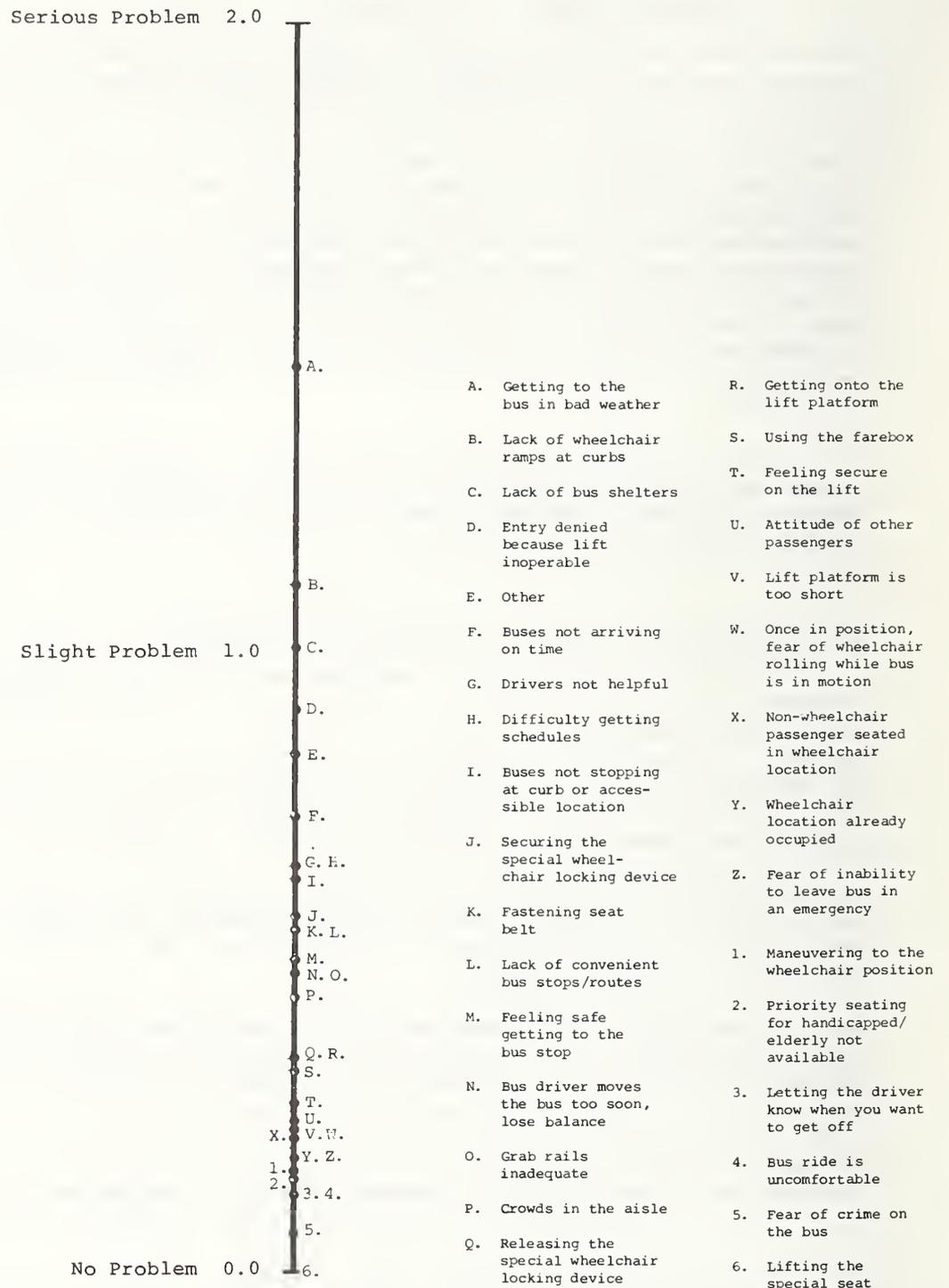
Reliability of lift service in Palm Beach was fairly good. CoTran reported no missed accessible bus trips, making substitutions (change-ups) when necessary to insure the availability of accessible service.

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<sup>\*</sup>Using the following scale: 2-serious problem, 1-medium problem, 0-no problem.

Figure 5-2

PROBLEMS LIFT-USERS ENCOUNTERED



A more clear-cut measure of service reliability is the trip denial rate. Trip logs maintained by the drivers show that, on average for the demonstration period, only 1.6% of attempted boardings were denied (ranging between 0 and 14%; see Figure 5-3). It is possible that denials were actually more frequent than was reported by the drivers. Of 16 lift-users who had made lift trips in the 3 months prior to the survey, 6 (38%) reported they had been denied at least one trip. Thus although reliability may have been fairly good in terms of percent of trips denied, because the number of riders is small, a considerable portion of the lift-users have been inconvenienced.

Denials were usually attributed by drivers to lift malfunctions (76%), although a few instances of problems with seats and seat belts were noted. Only one instance was recorded of a power-chair which would not fit on the lift, despite the media coverage given this problem with the lift. It is also suspected that this problem may have occurred more often than reported. Trip denials due to an inoperable lift was the fourth most serious problem noted by the average user (of 31 potential problems listed in the user survey). Forty percent of users noted it as a serious difficulty they experienced with the service. Perhaps the seriousness of the problem is related to the low frequency of service, that is, a denial will typically result in an excessive wait time.

## 5.5 CONVENIENCE OF THE LIFT-BUS SERVICE

A major and significant difference between lift-users and disabled non-users identified in a survey is that users live closer to a bus stop; 44% live less than one block away. For most residents the service is not as convenient.

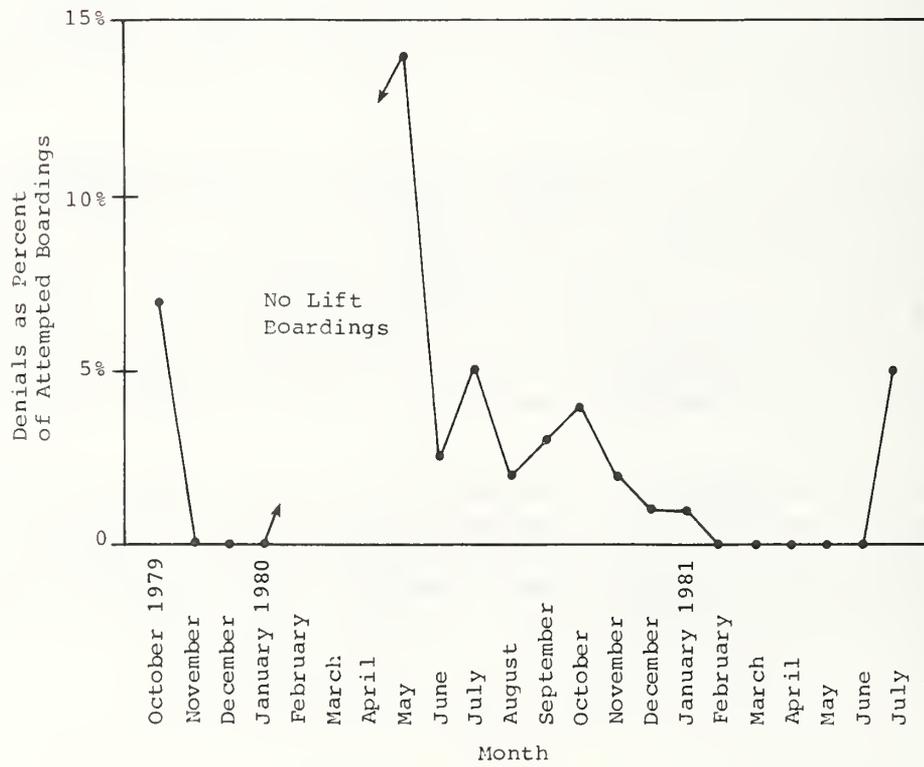
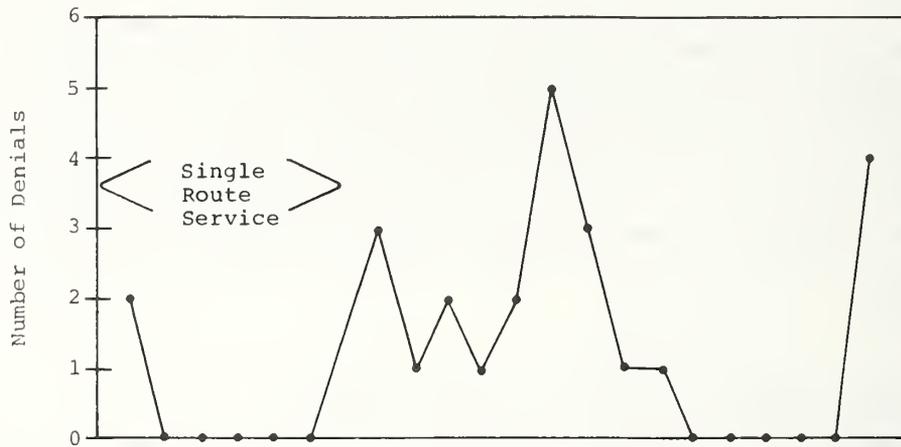
Overall, almost half of users surveyed rated the service as "very good." Nonetheless, a similar proportion of the surveyed users said they would prefer a door-to-door service. Perhaps the fact that these individuals have few alternatives explains why they like the service but would still prefer a door-to-door service.

The vast majority of non-users believed they were physically able to use the lift-equipped bus, although 40% believed they would need assistance from an escort to get to the bus stop and 33% to ride the bus. Interestingly, similar proportions of users also noted the need for an escort to travel by bus and at least 25% regularly use escorts when travelling. The large number of users and non-users who need assistance to travel by lift-bus indicates that the lift-bus is not sufficient to allow many disabled people to travel independently. Nevertheless, it does enable those who cannot travel alone to travel with a friend who might otherwise be unable to assist them (i.e., in an automobile or taxi).

The large percentage of non-users who believe they would need help on the bus suggests that they either need help to maneuver on the bus and fasten the securement device or assistance at their destination. Marketing material indicated that drivers would assist passengers if necessary; however, it is possible that some non-users were not aware of the degree of driver assistance available.

Figure 5-3

TRIP DENIALS



## 5.6 LIFT-USER SAFETY AND SECURITY

### 5.6.1 Perceptions

Safety and security are important issues to all passengers; it was suspected that more vulnerable elderly and handicapped travellers would be even more concerned with these issues than the average passenger. Concerns about safety and security were expected to focus on the safety of the lift and tie-down devices, bus operator driving and lift operating skills and street and in-vehicle crime; however, survey results showed that these were only minor problems. "Feeling safe getting to the bus stop" was the greatest problem indicated by users of five potential problems related to safety and security included in the survey. Since few of CoTran's routes operate in the evening, lack of concern about personal security is not surprising; the lack of concern about safety may be a more significant result.

### 5.6.2 Accident History

A number of accidents have taken place each month since the lift service was initiated. Generally, these have involved neither wheelchair passengers nor lift malfunctions, but have been related to lift-bus design features. These accidents have involved ambulatory riders tripping on the front steps or catching fingers in the door while boarding. This is very likely due to the higher than normal height of the first step which resulted from the installation of the lift and the continuing problem of lift drifting. Another related cause is the lack of well-placed grab rails on the lift-buses. CoTran has tried to reduce accidents resulting from the latter problem by placing "home-made" rubber guards around those areas upon which passengers should not rest their hands while boarding or alighting.

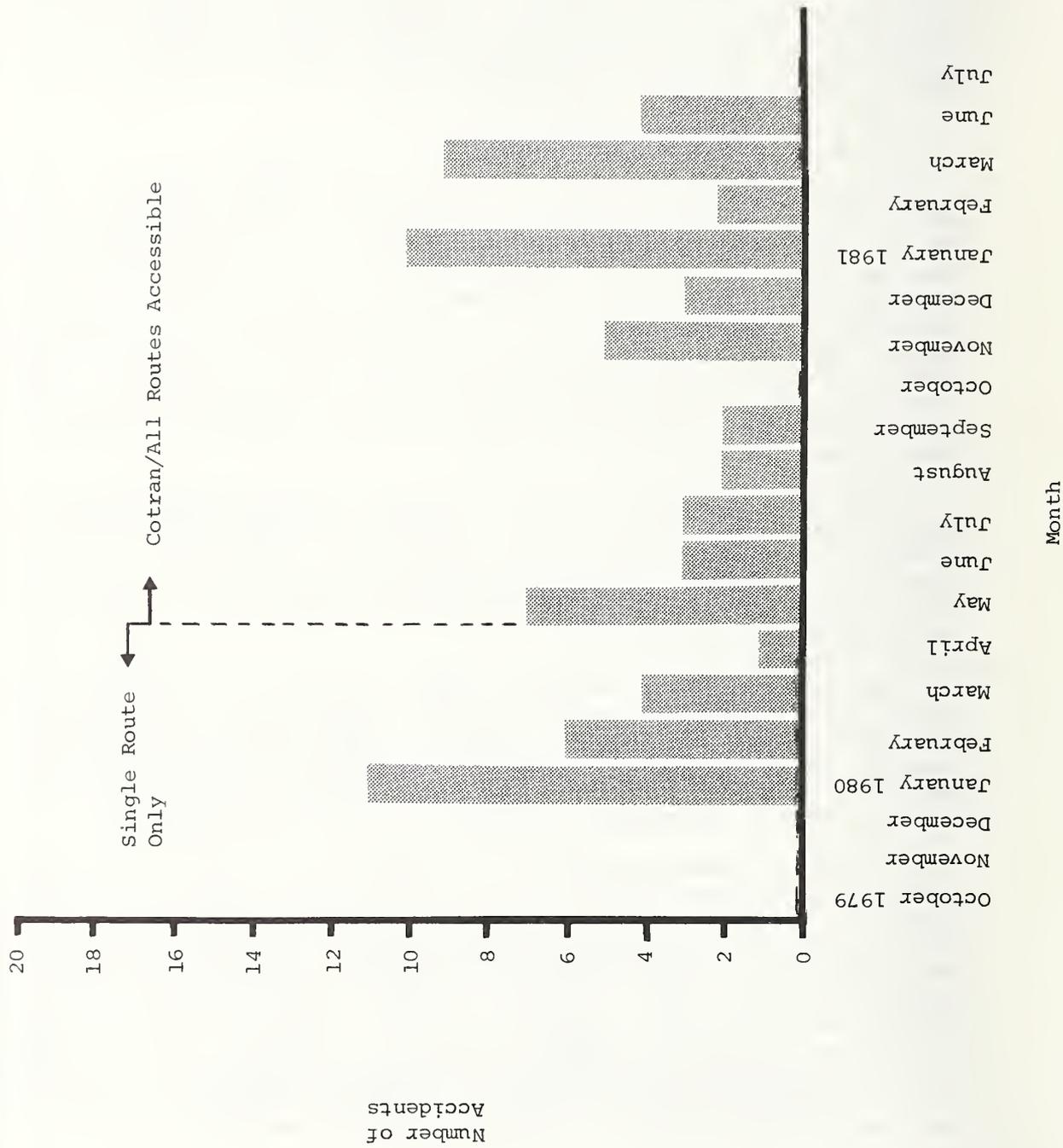
There were two incidents which involved handicapped passengers, one of which related to the lift. In this accident, which occurred in January 1981, a wheelchair passenger using a power-drive chair began to roll off the platform. It was reported that the chair was positioned such that one wheel was not protected by the apparently operational safety door. Fortunately, there was no injury to the passenger.

The other and more serious accident involving a handicapped passenger during the demonstration period involved a Goodwill (sheltered workshop) worker. This frequent bus user was severely injured when alighting from the rear door, as the bus began to move before the person had cleared the door. This accident had nothing to do with the lift, but may, nevertheless, have harmed CoTran's image as a potential transporter of handicapped people.

During the demonstration period, passenger accidents increased, most likely due to seasonal variation in ridership (see Figure 5-4). The average number of passenger accidents during the period does not appear to have greatly increased over pre-demonstration conditions. However, the demonstration period cannot be easily compared with pre-implementation conditions, since service to a major senior citizen development was eliminated as the lift-bus service was implemented. Several passenger accidents, mostly involving the front steps, routinely occurred when serving this large group of riders. It is the belief of CoTran staff that if these accidents could be isolated from the other pre-demonstration accidents, one would find that boarding accidents may have in fact increased as a result of the new equipment.

Figure 5-4

"LIFT-RELATED" PASSENGER ACCIDENTS



## 5.7 IMPROVEMENTS NEEDED TO THE LIFT-BUS

When asked which improvements are needed to enhance the lift-bus, non-users noted "greater public awareness", "more wheelchair ramps at curbs" and "more and better located bus stops" as the most important improvements (see Table 5.2). Curb cuts are clearly needed to remove a major remaining barrier to the use of fixed-route service. However, curb cuts do not fall under CoTran's jurisdiction. An obvious conclusion borne out by the survey is that a program of curb cuts coordinated with local jurisdictions would greatly enhance the potential of accessible fixed route-bus service.

Finally, the importance of more convenient bus stops is underscored by the fact that non-users live farther from bus stops than users do -- only 33% of non-users lived within 3 blocks of a bus stop compared to 67% of users.

Other improvements which were rated very necessary by a somewhat smaller group included a "longer lift platform" and "more wheelchair locations on the bus". It should be noted that these non-users might not have been acquainted with these characteristics of the lift service at the time of the survey. Nevertheless, it is interesting that 24 non-users felt a longer lift platform was needed, about the same number that indicated they use power-drive or Amigo chairs.

Table 5.2

### IMPROVEMENTS NEEDED TO LIFT-BUS SERVICE

	Average Response Of:* Non-Users
More, Better Stops	1.57
More Curb Cuts	1.58
Longer Lift Platform	1.15
More Wheelchair Locations	1.27
Kneeling Buses	0.22
Greater Public Awareness	1.59
Other	0.20

\*Based on scale of: 2 = very important  
 1 = somewhat important  
 0 = not important

## 5.8 IMPACTS ON THE ABLE-BODIED BUS RIDERS

Delays due to lift operation have often been suggested by opponents of fixed-route accessible bus service as adverse impacts that accessibility would have on other riders. This potential impact is important because it has been a widespread concern of operators and since any resulting displeasure on the part of other riders might also be sensed by disabled users.

Throughout the demonstration period, drivers took measurements of bus stop dwell times where lift-user boardings and alightings took place. However, it appears that several drivers recorded travel time between origin and destination, rather than the dwell time. Thus, the data is of questionable validity. Examining the trip logs, one can estimate which times were incorrectly recorded. This was done for one sample month, March 1981. Of 133 measurements, 100 were recorded as 10 minutes or less and were believed to be actual dwell time measures. They averaged 3.5 minutes, with a standard deviation of about 1.8 minutes. Although these dwell times are large enough to affect the schedule, the lift ridership rate has been too low to justify taking time checks to precisely measure the resulting impact. It is believed that, on the average, service has been only marginally affected by lift boardings and alightings. Note that drivers responding to a survey generally believed that the lift had not caused service reliability to deteriorate -- only 12% said lift problems have affected reliability "considerably". Of course, if ridership were higher, the impact on schedule adherence could be much greater.

The driver survey also provided an opportunity to obtain third-party observation of the interactions between disabled and able-bodied passengers. While generally these interactions were satisfactory, a small percentage of the drivers noted impatience or ridicule on the part of other passengers. Drivers most often reported "no response" to characterize the reaction of the disabled passenger in the face of such adversity, although both angry and apologetic reactions were noted as well.

Although three quarters of able-bodied riders responding to an on-board survey were aware of the lift service, nearly half had never seen the lift in operation.\* Of those who had witnessed lift operation, only 15% had seen the lift in use 6 or more times (over the year since it began operation). Thus, few riders could have experienced great inconveniences. Over three quarters of all passengers who had seen lift operation perceived no significant delays. A majority of these people reported the average delay as less than 3 minutes. Even more important, however, is the fact that about three quarters of these people also perceived the longest delay to be less than 5 minutes.

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\* An on-board survey of able-bodied bus riders was conducted in May 1981 by CoTran staff members. The survey involved selected routes at several times of the day. The total sample obtained was 330, (of a total daily system-wide ridership of approximately 10,000) which should enable proportions to be estimated within + or - 6% at the 5% significance level. Note that the survey is a sample of trips not unduplicated riders. While riders only filled out a single survey, the results are biased toward frequent riders since they have a greater likelihood of being surveyed. Perhaps this bias is appropriate since infrequent riders are less likely to have observed a lift in use.

The general attitude of other riders seems to have been positive. Overwhelmingly, passengers would give up their seat to a wheelchair user. Of the nineteen on-board survey respondents who provided written comments on the lift service, seventeen made favorable statements, ranging from those expressing tolerance, such as "the lift doesn't delay the bus by that much," to those expressing approval, such as "glad to have the lifts" and "believe in total equality for the handicapped and blind and appreciate the cooperation of CoTran in this area." Note that lift-users indicated the following in response to a question on whether they perceived other riders were annoyed by the lift: 6% said "very much so" and 33% said "somewhat", while 56% answered "no".

## 5.9 SUMMARY

CoTran began operating accessible lift-bus service on all routes and runs in May 1980. It operates 20 routes throughout Palm Beach County and has a peak hour vehicle requirement of 58. CoTran primarily provides service on major arterials, with only limited residential area service. Generally, routes operate infrequently with 45 minute to one-hour headways; the more frequent routes still have relatively long headways of 20-30 minutes.

Limited residential access and long headways have meant that potential passengers frequently have long walk distances and must rely on schedules in planning their trips. The demonstration surveys showed that these factors were of substantial importance to lift-users and to potential users. A major difference between users and non-users is that users live substantially closer to a bus stop. Non-users cited "more and better located" stops as a major needed service improvement. Although lift-service has been reliable with a low denial rate, the low frequency of service on most routes makes denials, when they do occur, serious problems for users.

Safety and security relating to use of the lift and travel by bus were not major issues among either users or non-users, and few accidents directly attributable to the lift have been reported. However, both groups did express safety concerns relating to the need to cross major streets to reach the bus stop. Also posing a significant barrier to both users and non-users was the lack of curb cuts in many locations, although these are not directly under CoTran's control.

Finally, the level of service for other (able-bodied) passengers has not been substantially impacted by the operation of accessible service. Nearly one quarter were unaware of the service, and half had never seen the lift in operation. Those that had seen someone use the lift did not perceive lift use to cause inconvenient delays in service, and most had a positive attitude towards the service concept in general. However, a sampling of dwell times indicates that with a higher level of lift-user ridership, service reliability could become a problem. What has been something of an issue has been the increase in minor passenger accidents (e.g., tripping) caused by the higher than normal position of the first step. This and the fact that the buses do not have a kneeling feature contributed to a reversal of CoTran's initial policy which had not permitted non-wheelchair passengers to use the lift. However despite lift use by some ambulatory persons, minor accidents at the front steps continue to be a problem.



## 6: TRAVEL BEHAVIOR

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Since improving the mobility of the transportation handicapped through provision of accessible fixed-route transit was the major objective of the project, their response to the service changes was a key aspect of the evaluation. The most important travel behavior issues are:

1. Were significant numbers of transportation handicapped people able and willing to use a fixed-route bus service equipped with lifts?
2. Which subgroups of the transportation-handicapped population remained unserved? Why were these groups still unable to use the service?
3. Did the implementation of accessible fixed-route service significantly affect the mobility of transportation handicapped persons?

These issues are discussed in detail in this section.

### 6.1 DATA USED IN THE TRAVEL BEHAVIOR ANALYSIS

A variety of sources of data were used to analyze the travel behavior impacts of the lift-bus project. These included:

- Driver Trip Logs
- Surveys and Travel Diaries of Disabled Lift-Users and Non-Users
- Surveys and Travel Diaries of Area Residents

#### 6.1.1 Driver Trip Logs

Drivers were asked to record each time a lift boarding occurred. The date, time, route-number, locations of boarding and alighting and weather conditions were noted, as well as whether the person was using a wheelchair, and any unusual circumstances. Drivers also estimated the time required to board or alight. This information was recorded on the back of the operator's report, which was redesigned specifically for this purpose (see Figure 6-1).



### 6.1.2 Surveys of Disabled Lift-Users and Non-Users

Surveys of lift-users and non-users were conducted beginning in the spring of 1981 and extending into the early summer. The surveys were conducted through home interviews and by telephone. A variety of sources were used to contact potential survey participants, including:

- property appraiser's list of tax exemptions for disabled homeowners;
- list of parking permits issued to disabled automobile owners;
- CoTran's list of handicapped identification card holders;
- respondents to a newspaper advertisement;
- respondents to a mailing by human service agencies; and
- volunteer participants identified by the Barrier-Free Design Committee.

Despite the fact that more than 1000 people were contacted, only 80 usable surveys were obtained (see Table 6.1).

Table 6.1

#### SURVEYS OF DISABLED PERSONS: PARTICIPATION BY SOURCE OF CONTACT

Source	Number of Persons Contacted	Usable Responses	
		Users	Non-Users
Property Appraiser List	350	4	23
Parking Permits	50	1	9
CoTran I.D.'s	500	2	5
Advertisement	N/A	1	6
Agency Mailback	300	4	14
CoTran Rider Mailback	N/A	7	0
Miscellaneous (includes those identified by B.F.C.)	N/A	1	3
	Total	20	60

Of the 80 individuals surveyed, only 20 were lift-users (defined as anyone who had used the lift in service). These individuals appear to represent at least 50% of the total "user" population.\* Thus, proportions estimated are accurate to  $\pm 16\%$  at the 5% significance level. Only 60 non-users were surveyed, clearly a very small portion of the total non-user segment of the eligible population, and substantially less than the target of 300. Proportions of non-users are estimated to be accurate to  $\pm 14\%$  at the 5% significance level.

Travel diaries kept by respondents were of limited use in the analysis. As many of the respondents were unwilling to complete diaries (and many of those that were willing were unable to complete them successfully), only 7 diaries were obtained from users and 16 from non-users.

### 6.1.3 Surveys of Area Residents

A special survey/diary effort was undertaken as part of the evaluation to obtain detailed travel data for the (elderly and non-elderly) able-bodied population for use in research at the Transportation Systems Center. It was decided to limit this study to the central urban areas with large elderly populations.

A random sample of 2200 residents of Lake Worth and West Palm Beach selected from voter registration lists were mailed brief surveys. Mailback surveys were used to obtain demographic and travel data and to identify a sample for the purposes of the subsequent travel diary survey. The initial mailing, a follow-up reminder, and a mailing to an additional 2000 persons resulted in 1228 surveys (a 29% response rate).

Of the total respondents, 286 (23%) were willing to participate in a travel diary survey, 44% of whom were 65 years of age and older. In the end, only 117 acceptable diaries were obtained, 42% from senior citizens.

## 6.2 RIDERSHIP

### 6.2.1 Lift Boardings

A primary measure of effectiveness of the lift service is the number of lift-trips served. CoTran bus operators were instructed to record all lift boardings on their operator's report. This count of riders began in October 1979 when a single lift route was introduced and continued through the conclusion of the demonstration in July 1981. The single route service experienced

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\* Surveyed lift users reported making 342 lift trips in the 3 months prior to being surveyed. Between April and July 1981 Cotran recorded 113 trips per month, indicating that the interviewed lift users represented just about all current users. However, a comparison of origin-destination trip data revealed that the surveyed trips are not identical to those recorded by drivers. Thus, we assume that the driver records were undercounting ridership and that the survey did not reach all the users during the survey time period. Since there were likely to have been users earlier in the demonstration who may have been missed as well, we have assumed a conservative figure of 50% for the survey sample.

some usage for the first few months -- 29 lift boardings were recorded in October -- and declined sharply in the succeeding months. During the following May, when service on all routes was implemented in the midst of a tremendous marketing program, only 18 boardings were recorded, just a little over half the number of the previous October. Perhaps the reason for the lower ridership in May was that much of the trial ridership had already occurred. Ridership grew in stages as the project progressed, reaching a peak of 151 by the following March (1981) (see Figure 6-2). The timing of the initiation of full accessible service in May may have contributed to the slow growth rate. CoTran ridership typically peaks in February or March and falls in the late spring and summer as winter residents return north (see Figure 6-3). As a result, a drop in lift usage was noted in the late spring of 1981. It is important to note that the surveys and diaries indicated that there were several passengers whose trips were not recorded on driver logs; thus, some undercounting of lift usage is evident.

A review of driver trip logs indicated that only about 10-20 individuals may have been responsible for the trips recorded in any given month. Thus, over the entire course of the project, there were probably very few unduplicated individual users (which suggests that our user survey may have reached a very large portion of the lift ridership).

Initially, CoTran only permitted lift-use by persons in wheelchairs. By September 1980 the policy had changed to allow ambulatory (non-wheelchair) passengers to use the lift, since CoTran buses have no kneeling feature to otherwise assist those who have difficulty boarding via the front steps. However, it appears that this policy change was never advertised to the public. As a result, there may be a number of potential lift users who have not tried the lift because they do not use wheelchairs. March 1981 figures show 16 boardings by ambulatory disabled or just over 10% of lift trips. However, ridership reports for the succeeding four months show no lift usage by ambulatory passengers -- a surprising result.

There are several possible reasons for the apparent cessation of lift use by ambulatory disabled. Note that the 16 trips were made by only 4 or 5 individuals at most. Perhaps they were winter-time residents or simply found other travel means. Since several recorded trips were only one-way trips, there is evidence that the individuals had an alternative mode for at least one direction of the trip. Another likely explanation is that for some of these individuals, their disability may have been temporary and they continued to use the bus without using the lift. We may also suspect that driver logs are not accurate. While drivers could have failed to specify "ambulatory" when they recorded continued trip making by ambulatory lift-users, it is noteworthy that at least one destination which comprised nearly one-third of ambulatory lift trips in March (but no trips by wheelchair users) did not show up in the April driver trip logs.

The peak lift ridership of 151 per month recorded in March 1981 represents a mere 0.04% of total trips and 3.4% of reported handicapped trips.\* Over the course of the project, both lift-user and non-lift handicapped ridership has grown. In early 1981, handicapped ridership represented just over

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\* Handicapped ridership was recorded by the drivers on the basis of presentation of a reduced fare identification card or apparent handicaps (if the rider was elderly).

Figure 6-2

LIFT RIDERSHIP

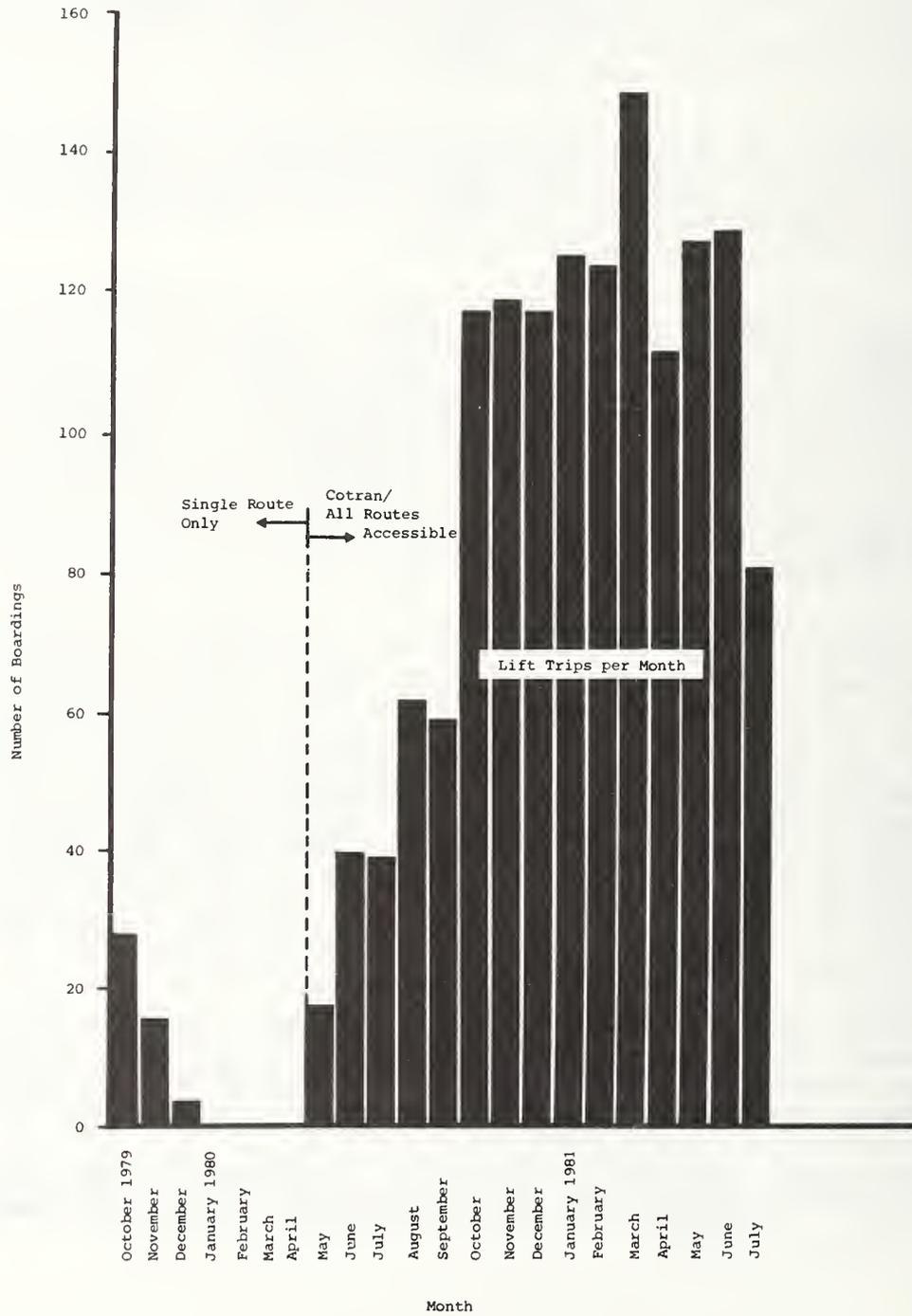
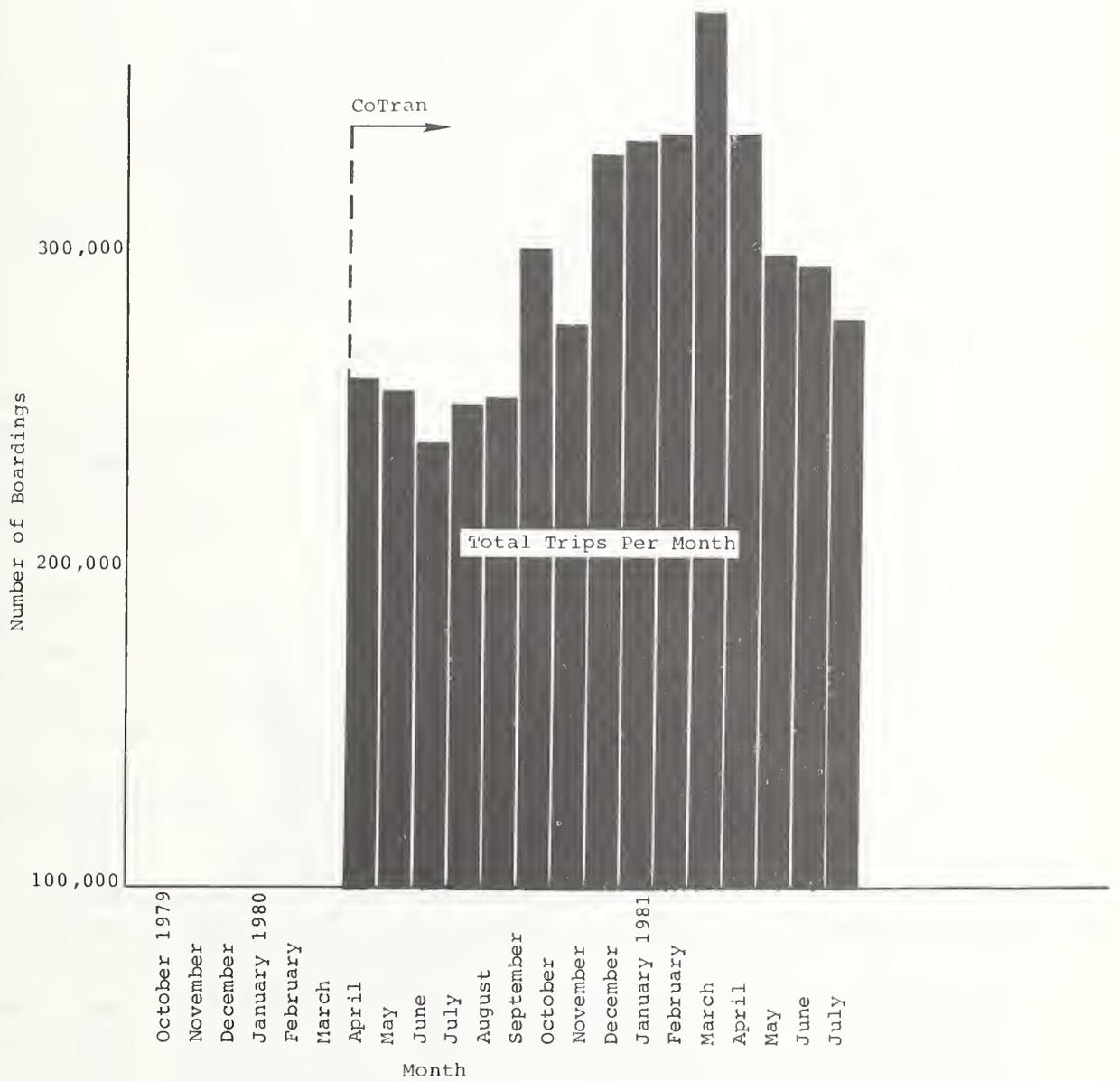


Figure 6-3

TOTAL RIDERSHIP (All Routes)



1.1% of all riders and lift users just over 3% of handicapped riders. While lift ridership grew to 3 times the amount in the period from June 1980 to June 1981, total handicapped ridership grew over 10 times. The extensive marketing oriented to the elderly and handicapped funded as part of the demonstration may have made a major contribution to increased ridership among the handicapped, even among those who do not need the lift. Of course, actual improvements to the service, particularly in the area of vehicle comfort may have greatly enhanced the usability of the service by handicapped people who may be very sensitive to ride quality, seating comfort, and temperature control.

The introduction of the lift service and other system improvements in May 1980 and the associated promotional efforts seem to have led to an increase in the number of reduced fare identification cards issued to the handicapped, from about 15 per month early in 1980 to about 25 per month after full service was implemented (see Figure 6-4). In May 1980 when intensive marketing efforts began and lift service was expanded to the systemwide level, 74 cards were issued. Over the entire project period, 523 cards were issued to handicapped persons. Note that elderly disabled people receiving reduced fare cards are counted as elderly rather than handicapped. The issuance of cards to elderly did not experience as pronounced a peak during the months when lift service was introduced and marketed. Over the course of the project, 10,744 identification cards have been issued to senior citizens at a rate of about 536 per month.

#### 6.2.2 Route Distribution of Lift Ridership

During thirteen months after full implementation of lift service, all but one of CoTran's 19 routes have carried lift users. One-half of this ridership has taken place on a single route -- Route 1. Route 1 is the major route of the CoTran system, operating in a north-south direction along U.S. 1 through downtown West Palm Beach and adjacent to the coastal communities and carrying about 35% of all passengers.

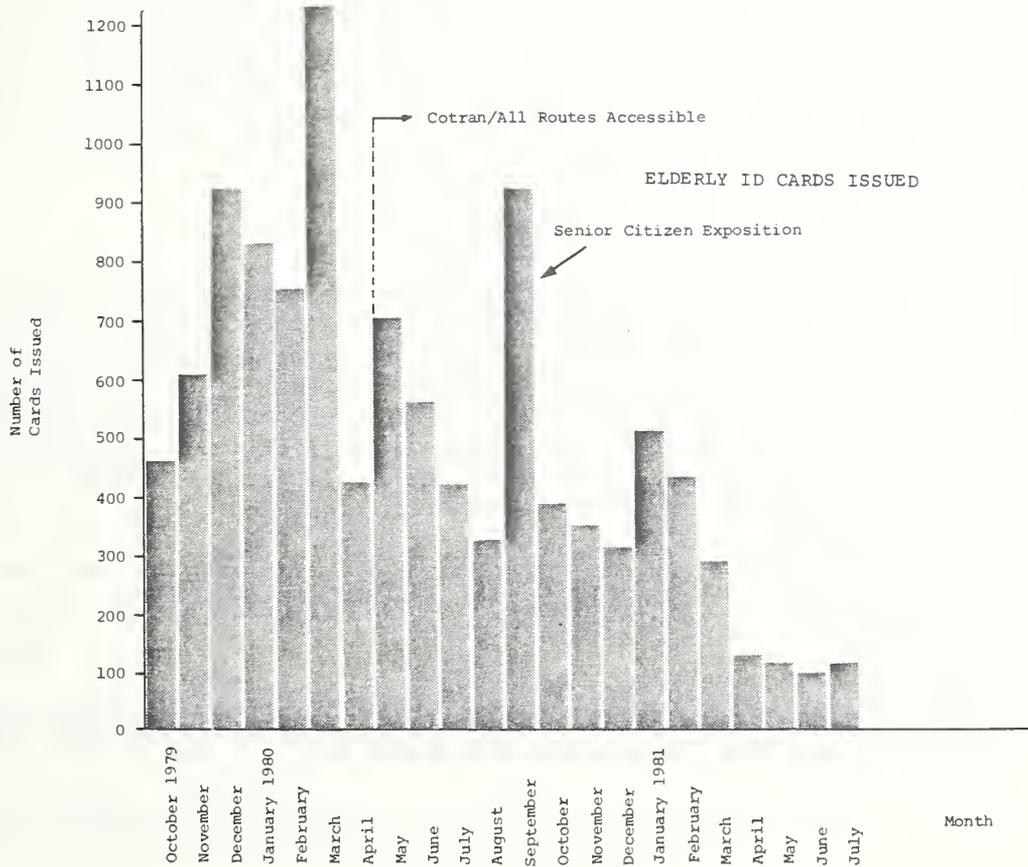
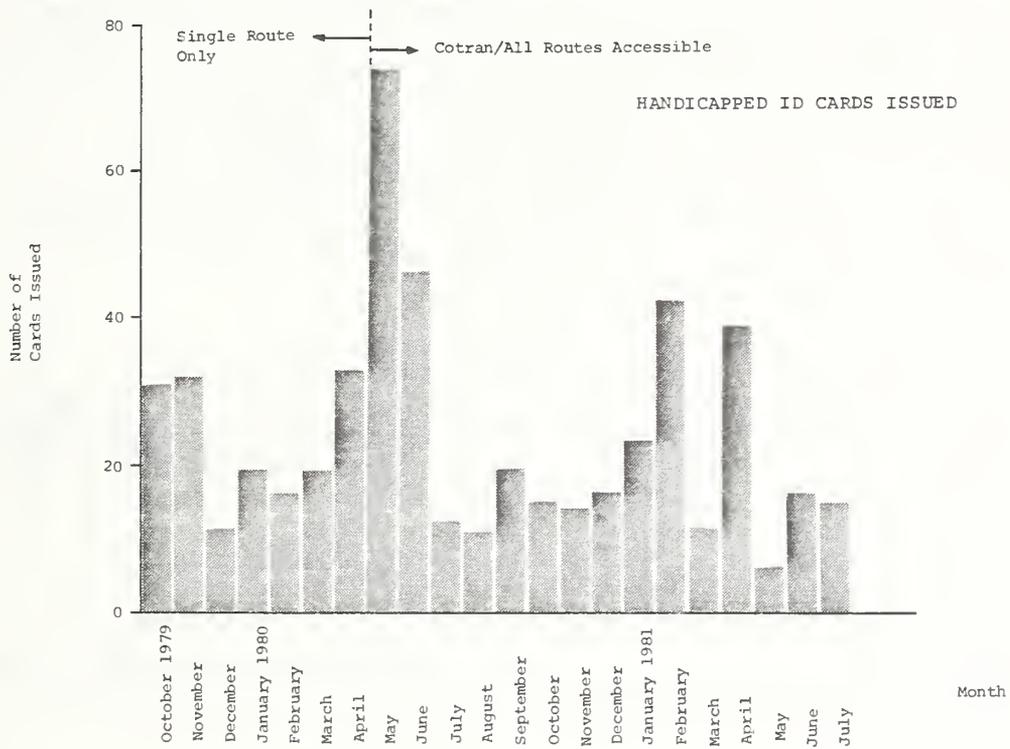
The routes which had the next largest lift ridership include Routes 2, 6, and 20 each of which served only 7-9% of lift trips. Route 2 also operates in West Palm Beach serving both downtown and the Palm Beach Mall as well as key residential areas. Route 6 is a busy crosstown route in Lake Worth, a community with a very large senior citizen population. Finally, Route 20 operates in the growing western edge of the dense West Palm Beach and Lake Worth.

The higher frequency of service on Route 1 may be one factor explaining its large share of lift riders; Route 1 operates every 20 minutes while Routes 2, 6, and 20 operate hourly.

Routes 1, 2, 6, and 20 all exceeded their proportional share of lift riders. However, if ridership is examined on a proportional basis, it is some of the routes with fewer lift riders that exhibited lift usage most out of proportion to their share of total ridership. For example, Routes 9 and 12 each experienced a share of lift riders over 7 times that of their share of general riders. Because ridership is so small, the apparent concentration of ridership on these routes could be due to one or two riders and thus is of little significance. Furthermore, these routes operate in very diverse areas, so that no site-specific explanation is evident.

Figure 6-4

ISSUES OF REDUCED FARE IDENTIFICATION CARDS



## 6.3 PROFILES OF LIFT-USERS AND NON-USERS

Information on the socio-economic characteristics of users and non-users was collected in the evaluation surveys. Since no information was available on the characteristics of the total non-user population, representativeness of the non-user group was assessed through comparison with a national handicapped population group that is anticipated to have characteristics similar to the target population. We compared our sample group to the individuals with paralysis and lower orthopedic problems surveyed in the 1977 U.S. Health Interview.\* This seemed appropriate given the nature of the disabilities reported in the surveys and the high incidence of use of mechanical aids. The comparison between the non-user sample and that "proxy" group is presented in Table 6.2.

In some respects the non-users appear different from the national population. Our non-user sample includes a larger proportion of males and smaller proportions of senior citizens and employed persons. It is not clear whether our sample fails to accurately represent the local handicapped group or whether in fact the handicapped population in the Palm Beach area is atypical of the handicapped nationwide. Since many people retire to the Palm Beach area, we would have expected a greater proportion of elderly and female persons (since the elderly are more likely to be female) among the survey group. Since this does not appear to be the case, we suspect that our non-user group may not be representative of the local target population. Due to the small sample size, the apparent differences between the sample and the national group are not significant and it is very difficult to be conclusive about the results.

Profiles of the user and non-user samples indicate that there are several similarities between them, particularly in terms of sex and degree of affiliation with human service agencies (see Table 6.3). Furthermore, although more lift users fall in the youngest and oldest age groups, the percentages around and over 55 years of age are identical for users and non-users. However, non-users in the sample are more likely to be employed and to have higher household incomes. Users are more likely to live alone, a characteristic that may be correlated with the age distributions.

### 6.3.1 Disability Characteristics

Table 6.4 summarizes the disabilities reported by survey respondents; use of mechanical aids is reported in Table 6.5. The high incidence of para- and quadriplegia among non-users correlates with their significantly greater use of wheelchairs (82% vs. 65% for lift-users). Use of walkers, crutches, braces, and walking canes is very similar among both groups; one might have expected a greater incidence of use of these aids among lift users given their reported frequency of orthopedic-related impairments. However, lift-users do show substantially greater use of personal escorts.

There is significant use of special car controls and personal lift vans by the non-users (13% and 30% for each aid, respectively). Higher household

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\* Source: Rehab Group, Incorporated, Digest of Data on Persons with Disabilities, prepared for Congressional Research Service, May 1979, p. 3 and 7.

Table 6.2

## REPRESENTATIVENESS OF THE SURVEY SAMPLE

	Non-User Sample (Sample Size = 60)	1977 U.S. Health Interview: Paralysis and Lower Orthopedic Problems (Sample Size = 4725)*
Male	62%	51%
65 and Over	15%	25%
Annual Income		
Under \$10,000	45%	48%
Employed	22%	31%

\*Source: Rehab Group, Inc., Digest of Data on Persons with Disabilities, prepared for the Congressional Research Service, May 1979. (Contains 1977 data.)

Table 6.3

## COMPARISON OF LIFT-USERS AND NON-USERS

	Lift-User Sample (Sample Size = 20)	Non-User Sample (Sample Size = 60)
<u>Sex</u>		
Male	60%	62%
Female	40%	38%
<u>Age</u>		
Under 35	30%	18%
35 - 54	25%	37%
55 - 64	15%	30%
65 and over	30%	15%
<u>Income</u>		
Under \$10,000	56%	45%
\$10,000 - \$19,999	39%	17%
\$20,000 - \$29,999	-	17%
\$30,000 and over	6%	22%
<u>Employment</u>		
Working	10%	22%
<u>Household Size</u>		
1	28%	17%
2	33%	42%
3 or more	40%	40%
<u>Human Service Agency Affiliation</u>	78%	74%

Table 6.4

## DISABILITIES REPORTED BY SURVEY RESPONDENTS\*

Type of disability	Lift-Users**	Non-Users**
Cerebral palsy	10% (2)	5% (3)
Muscular dystrophy	5% (1)	3% (2)
Multiple sclerosis	10% (2)	17% (10)
Arthritis	20% (4)	10% (6)
Epilepsy	5% (1)	-
Amputee	-	3% (2)
Temporary injury	5% (1)	-
Mental retardation	5% (1)	-
Blindness/visual impairment	10% (2)	7% (4)
Spinal cord injury	-	-
Paraplegic	15% (3)	17% (10)
Quadriplegic	5% (1)	20% (12)
Hemaplegic	-	-
Polio	-	10% (6)
Spina bifida	-	2% (1)
Orthopedic impairment	30% (6)	3% (2)
Stroke	15% (3)	5% (3)
Speech impairment	5% (1)	3% (2)
Deafness/hearing impairment	-	-
Heart impairment	5% (1)	5% (3)
Lung impairment	5% (1)	-
Other	15% (3)	24% (14)
TOTAL RESPONDENTS	20	59
Responses per individual	1.7	1.4

\*Respondents frequently indicated more than one disability category.

\*\*Numbers in parentheses are actual number of category respondents.

Table 6.5

## USE OF MECHANICAL AIDS OUTSIDE OF THE HOME BY SURVEY RESPONDENTS\*

Type of Aid	Lift-Users	Non-Users
Wheelchair	65% (13)	82% (49)
Walker	15% (3)	10% (6)
Crutches	5% (1)	7% (4)
Walking cane	15% (3)	12% (7)
Braces	10% (2)	5% (3)
Artificial limb	-	2% (1)
Guide dog	-	-
White cane	-	-
Escort	25% (5)	12% (7)
Special car controls	-	13% (8)
Personal lift-van	-	30% (18)
Other	5% (1)	5% (3)
None	5% (1)	2% (1)
TOTAL RESPONDENTS	20	60
Responses per individual	1.5	1.8

Type of Wheelchair	Lift-Users	Non-Users
Manual	62% (8)	55% (27)
Power-Drive (conventional)	15% (2)	29% (14)
Amigo power drive	15% (2)	6% (3)
Both manual and power-drive	8% (1)	10% (5)

\*Respondents frequently indicated the use of more than one aid.

incomes among non-users may make these options more feasible than for lift-users. The availability of specialized personal vehicles is probably a significant reason why many non-users do not use the lift bus.

A surprising 35% of lift users and 13% of non-users said they are able to travel by regular bus (i.e., without lifts). Nearly all non-users, however, said they would use the lift if they were to use the lift bus service. Table 6.6 summarizes the specific functional impairments related to bus use indicated by lift-users and non-users. A significantly greater percentage of users than non-users indicated they had difficulty walking, but the interpretation of this question is not clear; we would have expected a greater response among non-users, 82% of whom use wheelchairs. Perhaps some wheelchair users were never asked this question by the interviewers since the answer was so obvious. As expected, all lift-users indicated difficulty climbing stairs. These two problems, along with difficulty standing in moving vehicles, were the most frequently cited functional handicaps among both groups. A substantial number of individuals, particularly non-users, also have difficulty maneuvering through crowds. A large proportion of non-users also indicated problems waiting outside for buses, while few users noted this as a problem. Note that all of these problems are perceived; actual differences in abilities cannot be determined.

### 6.3.2 Factors Differentiating Users and Non-Users

In a number of respects (sex, age, household size, residential location, degree of affiliation with agencies) users and non-users are alike. However, they differ in several important respects. Non-users are wealthier, and are more likely to have use of special car controls and personal lift vans. Paralysis and quadriplegia are very prevalent among non-users while users are likely to have orthopedic impairments. Users are more likely to live alone, yet they are somewhat more likely to have personal escorts. Non-users appear to have slightly more difficulty with several important functions needed to use transportation, including maneuvering through crowds, waiting outside for buses, and standing in moving vehicles. These factors are probably wheelchair-related.

## 6.4 TRAVEL BEHAVIOR AND MOBILITY

### 6.4.1 Mode Availability

Non-users are more likely than users to have a vehicle they can drive, and to be able to get a ride from a household member (see Figure 6-5). These statistics reflect the greater availability of the automobile among non-user households as a whole: only 14% have no vehicle in their household, compared to 40% of users. Again, this could be a function of the generally higher incomes found among non-user households.

Users are more likely than non-users to have human service agency transportation available, despite the fact that users and non-users show roughly the same degree of affiliation with agencies. Eligibility for special transportation service for some non-users could be restricted due to such factors as income; for others, the agencies with which they are affiliated might not have lift-equipped vehicles available (a substantially greater proportion of

Table 6.6

## TRANSPORTATION HANDICAPS/FUNCTIONAL IMPAIRMENTS

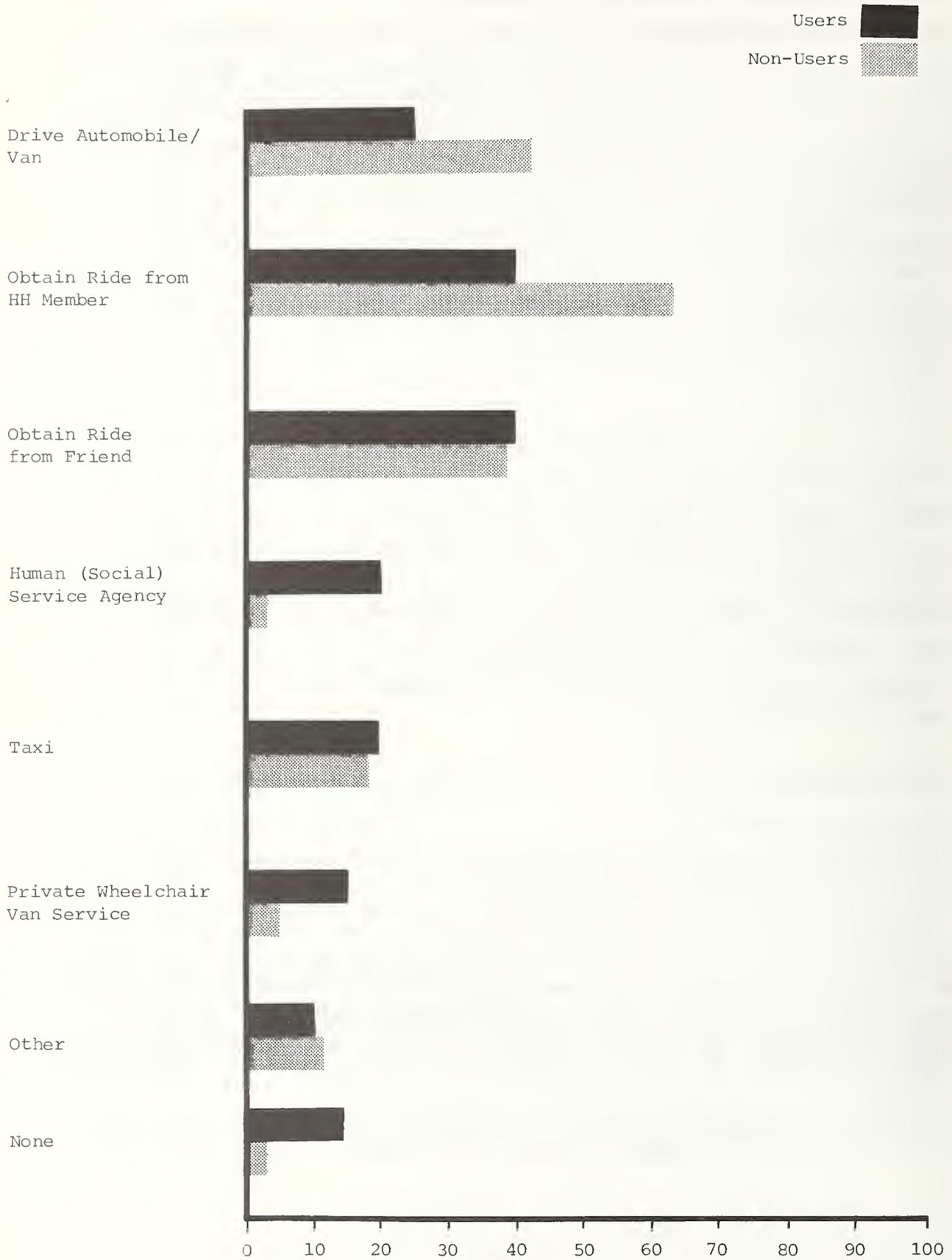
Type of Handicap	Lift-User Sample	Non-User Sample
Difficulty climbing stairs	100% (20)	87% (52)
Difficulty walking	95% (19)	77% (46)
Difficulty maneuvering through crowds	50% (10)	63% (38)
Difficulty waiting outside for buses	35% (7)	57% (34)
Difficulty standing in moving vehicles	65% (13)	73% (44)
Difficulty maintaining balance while bus stops and starts	55% (11)	58% (38)
Unable to reach or hold grips	20% (4)	38% (23)
Difficulty using coins, tickets	20% (4)	30% (18)
Communication difficulty	15% (3)	2% (1)
Visual difficulty	20% (4)	7% (4)
Difficulty in understanding standing the system	15% (3)	12% (7)
TOTAL RESPONDENTS	20	60
Responses per individual	5.0	5.0

the non-users use wheelchairs).\* In fact, only 47% of non-users said they would be physically able to use human service agency transportation, vs. 79% of lift-users. Similarly, there is a difference in physical ability to use taxis. In general, there are few other significant differences between lift-users and non-users in terms of physical ability to use various modes (see Figure 6-6).

\*Of a total fleet of 65 agency vehicles listed in Table 2.4, only 3 have lifts.

Figure 6-5

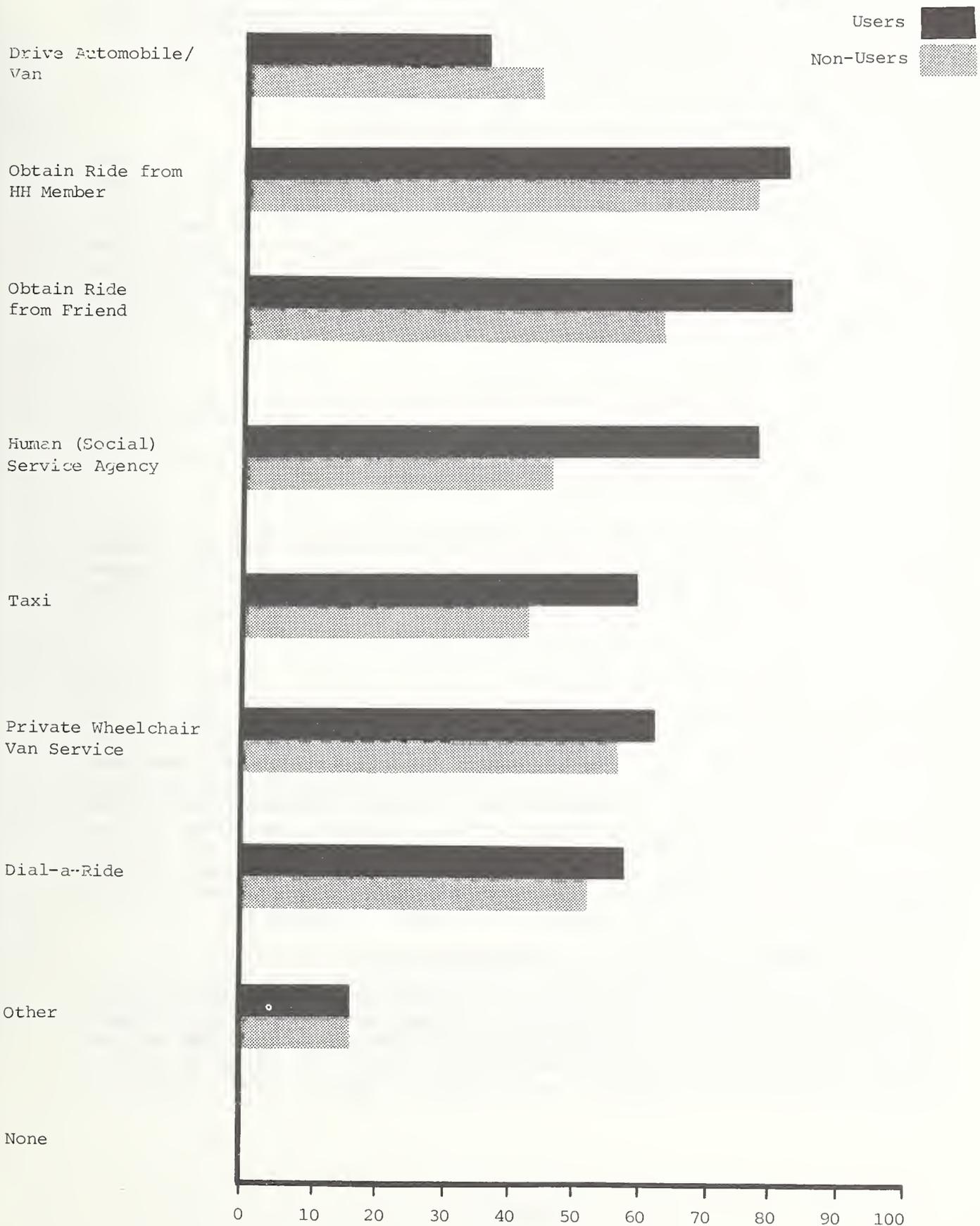
MODE AVAILABILITY



Percent of Respondents

Figure 6-6

PHYSICAL ABILITY TO USE VARIOUS MODES



Percent of Respondents

#### 6.4.2 Trip Rates

Survey data indicate that disabled lift-users and non-users both make approximately 14 trips per week (see Table 6.7). This is considerably higher than the National Survey of Transportation Handicapped figures (for mass transit areas) of 7.4 trips per week for all transportation handicapped, 5.5 for wheelchair users and 6.2 for those using other aids. In fact, this trip rate is about equal to that of able-bodied individuals, who typically make about 13 trips per week, according to the National Survey.

While these national statistics show the able-bodied travelling at a rate twice that of the TH, a survey of the "general" population in the area revealed a trip rate of only 18 per week; however, this survey was concentrated in the central urban areas of the county, West Palm Beach and Lake Worth, resulting in a bias towards older and female respondents who can generally be expected to travel less than the average resident. While it is possible that all residents of Palm Beach have higher trip rates than the national average, it appears that the transportation handicapped population in the Palm Beach area is unusually mobile relative to TH persons nationwide and the local able-bodied population.

Lift-users were found to make somewhat fewer religious trips and more social-recreational trips than non-users; otherwise, trip rates by purpose are about the same. Work and personal business trips are more frequent among the general population than among disabled non-users; for other purposes, no significant differences were detected.

The trip rate data implies that further marketing of the service is unlikely to increase ridership substantially, unless some travellers make a shift from an alternative mode -- a rather unlikely possibility. This conclusion is derived from the fact that the user trip rate is now the same as that of the non-users and that both groups indicate only a small percentage of trips for which they currently lack transportation.

#### 6.4.3 Mode Distribution of Trips

Table 6.7 shows the distribution of weekly trips by travel modes for the week preceding the survey. As expected, non-users made much more use of automobiles, either as driver or a passenger (84% of their trips), sometimes walking/wheeling but rarely using human service agency, private lift van service or taxi transportation. In contrast, lift-users relied to a much greater extent on walking/wheeling and CoTran service (together constituting 67% of their trips). While Cotran was the mode used for more than one third of all lift-user trips, the frequency of lift-bus use varied greatly among individuals; during the week preceding the survey 63% made no trips on the lift-bus, while 16% made all of their trips on the lift-bus.

#### 6.4.4 Impact on Mobility of Disabled Lift-Users

The lift has substantially improved mobility for the majority of users, although the total number is quite small. Sixty-nine percent said that their overall tripmaking has increased due to the availability of lift-bus service. Nearly 70% said the service has enabled them to go to new places and activities, particularly for shopping, and social/recreational events. Even more

Table 6.7

## AVERAGE TOTAL TRIPS PER WEEK (BASED ON SURVEY DATA)

	<u>Lift-Users</u> (n = 20)		<u>Non-Users</u> (n = 60)	
	Trips	Percent	Trips	Percent
<u>By Mode:</u>				
Walk (Wheel)	4.60	32	1.30	10
Auto (Driver)	1.90	13	7.57	55
Auto (Passenger)	0.80	6	3.87	27
Human Service Agency	0.60	4	0	0
Taxi	0	0	0.05	1
CoTran	5.20	36	0	0
Private WC Van Service	0.20	1	0.08	1
Other	<u>1.20</u>	8	<u>0.76</u>	6
<u>By All Modes:</u>	14.50		13.63	

revealing is that 44% of users said that the most frequent trip which they now make on the lift-bus would not have been made at all before introduction of lift bus service. Similarly, 40% said they would not have been able to make the previous week's lift-bus trips without the accessible service.

The lift-bus has also increased the independence of users. Without lift-bus service, 50% of users would have had to rely upon rides from a friend or household member to make the previous week trips; before lift-bus service, 44% of users made their most frequent bus trips as auto passengers.

A comparison of lift-users and non-users after the lift-bus service was in place revealed no significant difference in their unmet needs for travel. In general, less than 10% of the disabled population often lacks transportation for work, school, shopping or "other" trip purposes.

## 6.5 LIFT TRIP CHARACTERISTICS

### 6.5.1 Trip Purpose

Social-recreational trips constituted the most frequent trip purpose of lift trips made by seven users (of 20 surveyed users) who reported lift-trips during the week before the survey. Furthermore, nine users who reported that the lift enabled them to go to new places and activities indicated social and recreational activities to be a substantial portion of their new activities. (See Figure 6-7.)

Figure 6-7

TRIP RATES BY PURPOSE/LIFT-USERS



### 6.5.2 Time of Day Distribution of Lift-Trips

The distribution of lift trips over the day (based on 10 months of trip data) appears rather uniform between the hours of 6 a.m. and 6 p.m. (see Figure 6-8). Small increases in trip-making during particular hours occur in the peak morning and afternoon hours. These are likely to correspond to one or two individuals who make frequent work or school trips. Because the number of individual users is so small the time of day distribution cannot be extrapolated to characterize the travel behavior of the entire market.

### 6.5.3 Influence of Weather Conditions

The vast majority of users surveyed indicated they would not travel by bus in the event of rainy weather and driver records bear this out. Most would postpone their trip rather than make it by any other mode. Over an eight month period the percentage of trips made in bad weather ranged from 0 to 6%.

### 6.5.4 Travel Time and Cost

Lift-bus users were asked in the surveys to indicate the fare and travel time for the trip they most frequently made by bus. Travel cost was 25¢ or less and travel time took between 30 and 45 minutes for the majority of the 15 or 16 responses, respectively. Time and cost using the lift-bus were contrasted with the time and cost of making the same trip before lift-bus service was available. Travel time appears to have remained about the same for most persons. For the seven people who responded to these questions and made the same trips before CoTran's lift service was available, two reported shorter travel times, two reported longer travel times, and two no change. Three reported higher costs, three lower costs, and one no change. No one appeared to have used a very costly mode of travel before CoTran. It was difficult to evaluate the impact on travel cost since previous to use of the lift bus service, the overwhelming majority of persons either were driven or did not make the trip. For the latter only Medicare may have been available. One could calculate substantial savings relative to Medicare fares; however it is apparent that few in the sample use Medicare or even consider it an available mode.

### 6.5.5 Bus Stop Access

About one-third of users said they needed personal assistance from an escort to reach the bus stop. However, only one-quarter of the users said they use an escort when traveling outside the home, which means that some users who would prefer an escort are traveling without one. Only 12% of non-users use an escort when traveling outside the home. If this indicates that an escort is less available among non-users, a substantial number of these individuals might not be able to use the lift bus, since 41% said they would need personal assistance to get to the stop.

As Figure 6-9 shows, there are not very striking differences between users and non-users in terms of how far an individual is willing to travel to a bus stop. One-quarter of each group indicated willingness to travel less than a block even in good weather. One surprise is that at least one-third of persons (slightly more in the case of users) are willing to travel 4 blocks or more to reach a bus stop, and in fact a substantial proportion of users appear

Figure 6-8

AVERAGE LIFT RIDERSHIP BY TIME PERIOD  
(August 1980 - July 1981)

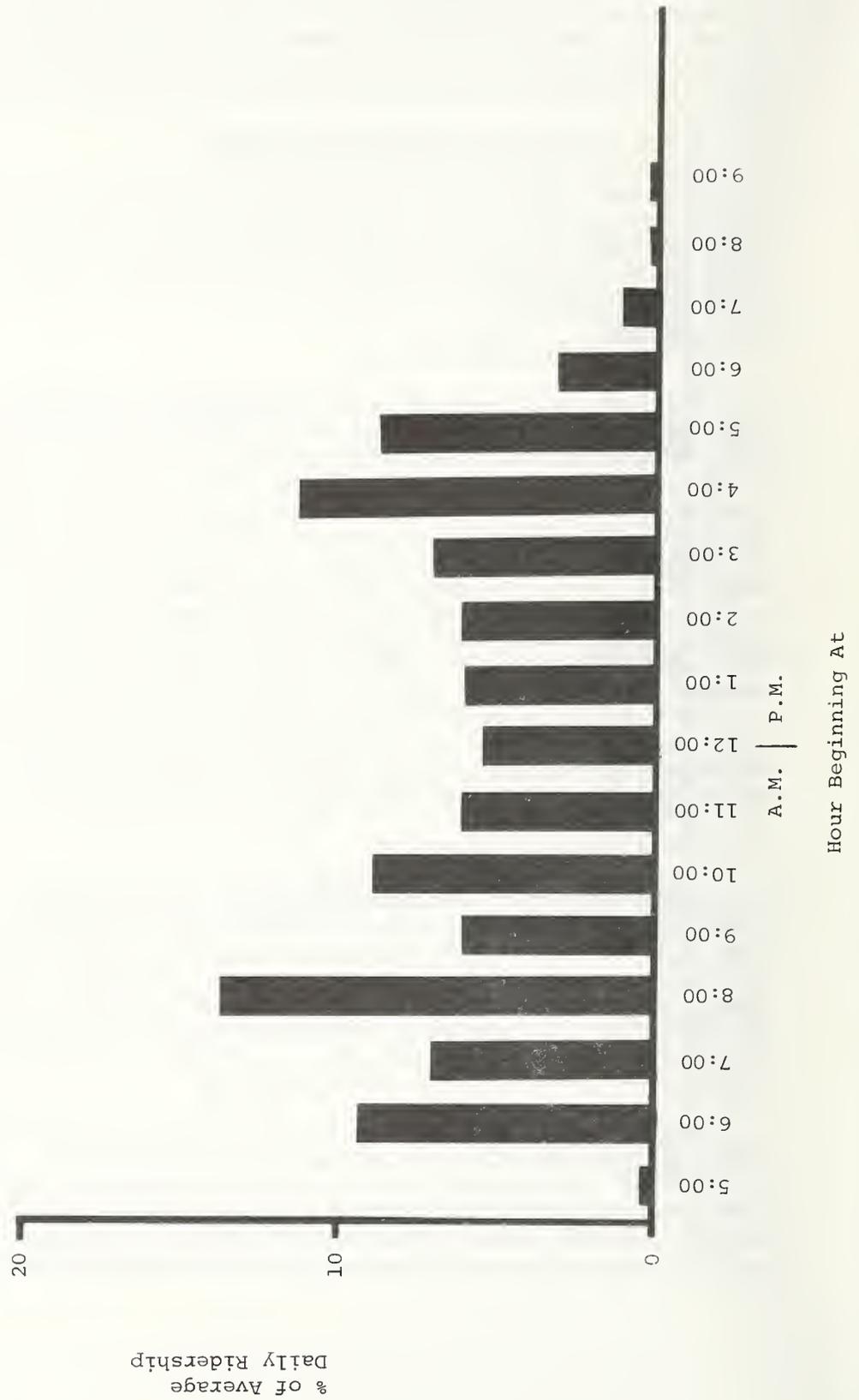
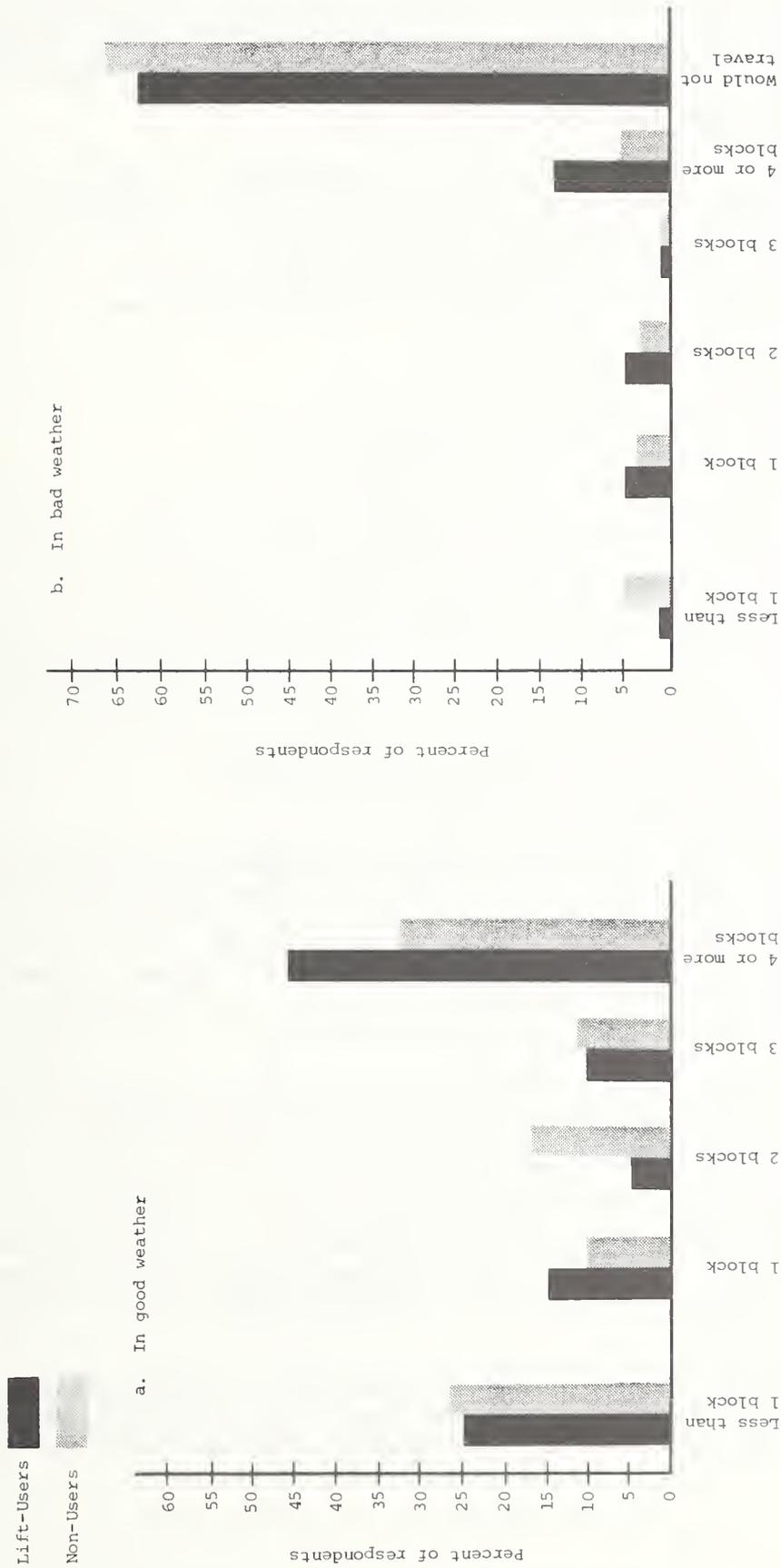


Figure 6-9  
 DISTANCE WILLING TO TRAVEL TO A BUS STOP



to travel three or four blocks or more (see Table 6.8). What seems to differentiate users from non-users is distance between their home and the bus stop; 49% of users live less than one block away, while most of the non-users who know the location of the nearest stop (nearly one-third were not sure) live 4 or more blocks away. In bad (i.e., rainy) weather, the vast majority of both users and non-users would choose not to travel.

On the whole, non-users perceived the environment to present more serious barriers to bus stop access than users, although many users also had more than just a slight problem with environmental barriers (see Table 6.9). Lack of curb cuts, rough street surfaces or lack of sidewalks, and the need to cross major streets were particularly noted by non-users. More curb cuts was one of the major user suggestions for improving the lift-bus service.

## 6.6 MODE CHOICE ISSUES

### 6.6.1 User Attitudes Towards Fixed Route Service

Lift-users rated the service as "good" to "very good" and 95% of them indicated they would use the service again. Most lift users have experienced increased mobility as a result of the service: nearly 70% reported traveling more often and a similar proportion were able to travel to new places and activities. Enthusiasm for the lift-bus service appears to be partially a result of the dependence of some users on the service - 40% are unable to make their lift trips by any other means. However, despite the high overall rating of the service, convenience is clearly an issue for some users; 50% said they would prefer a door-to-door service.

### 6.6.2 Reasons Why Non-Users Don't Use the Lift-Bus

Nearly 90% of non-users were aware of the lift bus service prior to the survey. Thus, few non-users cited lack of awareness as a primary reason why they had not tried the service. The most frequently mentioned reason was preference for other travel modes (see Table 6.10). Household auto ownership is high among this group, and many more non-users than users mentioned "drive" or "get a ride from a household member" as available means of transportation. Quite a few non-users have a personal lift van or a car with special controls. Many non-users felt that bus schedules and routes were not convenient.

Nearly all non-users believe they are physically able to use the lift buses, although about 40% felt they would need personal assistance to get to the bus stop. However, in this respect they are not very different from lift users, 30% of whom say they need assistance to reach the stop. The somewhat greater need for assistance among non-users could be a function of the greater average distances they live from the nearest stop. In fact, "the bus stop is too far" was one major reason cited by non-users for not having tried lift-bus service. The fact that users can make trips using the lift bus service despite their need for assistance may reflect greater availability of escorts (see Section 6.3.1).

The importance of easy access to a bus stop in encouraging ridership use was further highlighted by non-user responses to a question on their prospective use of the service given "convenient" stop locations at origins and

Table 6.8

## DISTANCE BETWEEN HOME AND NEAREST BUS STOP

	Lift-Users	Non-Users
Less than 1 block	49%	10%
1 block	7%	4%
2 blocks	7%	19%
3 blocks	12%	15%
4 or more blocks	<u>25%</u>	<u>51%</u>
	100%	100%

Table 6.9

## BARRIERS TO GETTING TO THE BUS STOP

	Average Response Of:*	
	Lift-Users	Non-Users
Curbs	1.25	1.65
Inclines	1.06	1.14
Rough Street Surfaces/ Lack of Sidewalks	0.94	1.55
Crossing Major Streets	1.37	1.52
Other	0.30	0.15

\*Based on scale of: 2 = serious problem  
 1 = slight problem  
 0 = no problem

Table 6.10

MAJOR REASONS WHY NON-USERS DON'T USE THE LIFT-BUS

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Prefer to use other travel means	40%
Schedule is not convenient	23%
Bus stop is too far	21%
Bus doesn't go where I want to go	11%
Bus system is too confusing	11%
Dealing with traffic might be dangerous	11%
Doesn't handle motorized chairs	11%

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destinations (see Table 6.11). Roughly 60-80% of the survey group said they would use the lift-service sometimes or often for shopping, medical and other trips. (About 45% said they would use the lift-bus at least sometimes for work or school trips; this smaller proportion is most likely due to the fact that only about 30% of the group report that they are full or part-time employed or students.\*) About half of the group indicated that they plan to use the lift-bus in the future. In addition to problems presented by bus stop location many non-users felt that more curb cuts were a necessity if they were to consider using the lift-bus service.

Over half of non-users felt they would need instructions in how to use the lift, and the lack of availability of instruction (or knowledge of how to obtain that which was available) may have been another factor contributing to lack of service use, although this does not appear to have been a major reason for non-use. A small group (11%) did not use the service because they found the bus system as a whole too confusing.

Potential problems related to physical factors such as maneuvering in the vehicle or transferring to another bus were not cited as major reasons for non-use of the service despite the fact that a substantial number of non-users reported functional handicaps relating to bus use (see Section 6.3.1). Similarly, only a small group of non-users indicated "dealing with traffic might be dangerous" as a major reason for not using the service, despite the fact the non-users as a whole reported this to be a serious bus stop access issue. These last results could be due in part to the fact that non-users were asked to only specify the main reasons why they had not used the service.

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\* The apparent discrepancy is in part due to differences in the number of respondents to the two questions.

Table 6.11

## POTENTIAL LIFT-BUS USE BY NON-USERS GIVEN CONVENIENT STOP LOCATIONS

Trip Type	Frequency of Use			
	Often	Sometimes	Never	Not Sure
Work/School	17%	28%	53%	2%
Shopping	27%	52%	16%	5%
Medical	21%	41%	32%	5%
Other	22	61%	13%	5%

## 6.7 INFLUENCE OF PROMOTIONAL ACTIVITIES

CoTran's marketing program appears to have been quite effective in informing the target population about the service. The survey of non-user indicated that almost 90% were aware of the lift-bus service. Furthermore, discussions with the Barrier Free Design Committee and representatives of several human service agencies and the Area Planning Board indicated a unanimous opinion that the program had sufficiently informed the target market.

It is noteworthy that human service agencies and health/rehabilitation workers were not significant information conduits for lift-users. Since about two-thirds of the surveyed lift-users and non-users have some affiliation with service and/or rehabilitation agencies, the lack of a major agency/health-rehabilitation worker role indicates that agencies have simply not made great efforts to promote the service to their clients.

Various influences encouraged users to try the service; none stood out as the most effective. Demonstrations of the lift-bus, which reached 45% of the users and 14% of the non-users surveyed, did not appear to be the most influential factor for any of the users (see Figures 6-10 and 6-11). However, lift-users generally rated such training as very helpful.

## 6.8 SUMMARY

### 6.8.1 Profiles of Lift-Users and Non-Users

A comparison of surveyed lift-users and non-users revealed that they are similar in some respects, such as sex, residential location, occupational status, use of aids, functional difficulties and affiliation with agencies. There are, however, several noteworthy differences. Non-users are wealthier, are less likely to live alone, have greater access to automobiles and make greater use of personal lift-vans and special car controls. These factors

Figure 6-10

HOW LIFT-USERS LEARNED ABOUT THE LIFT-BUS

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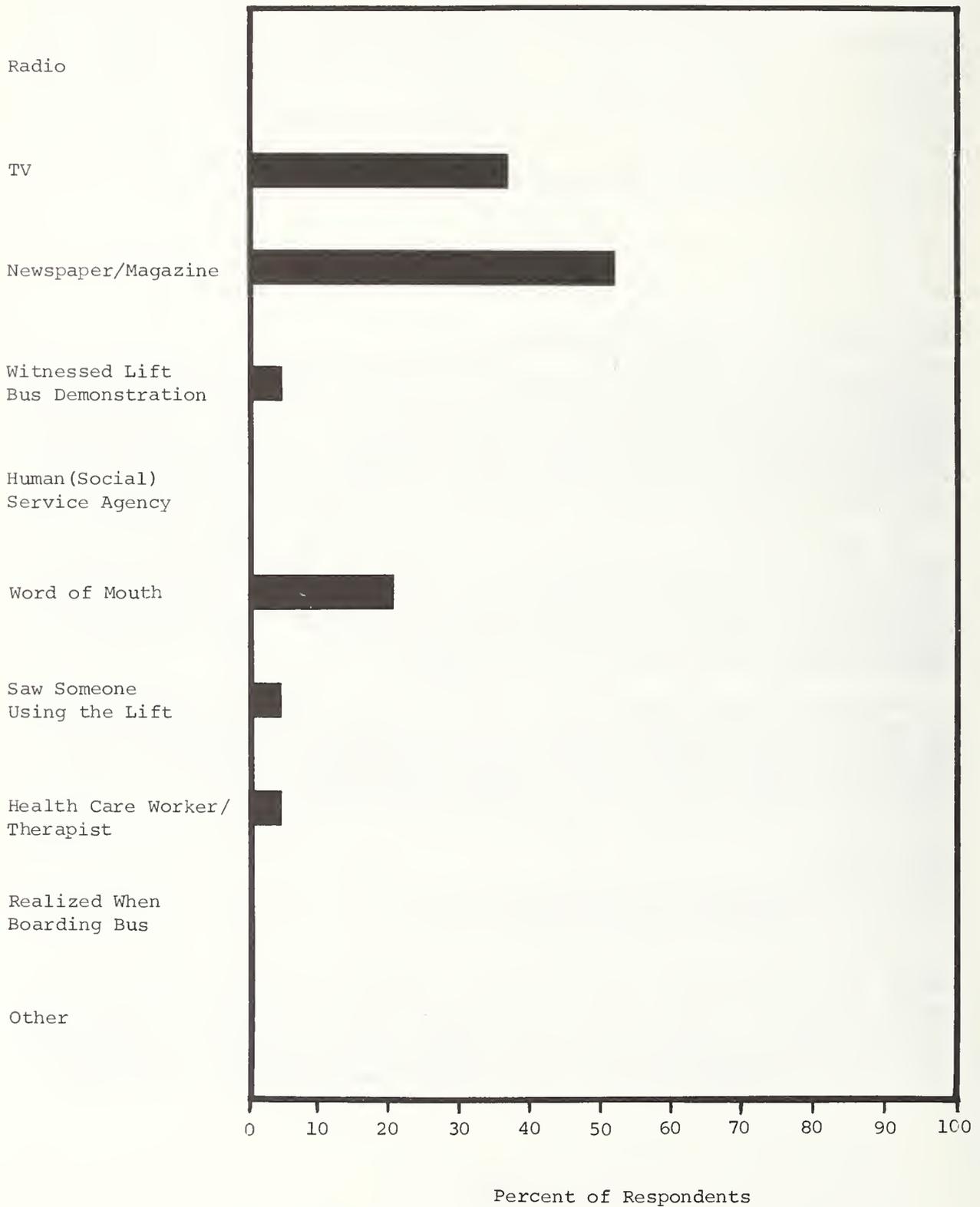
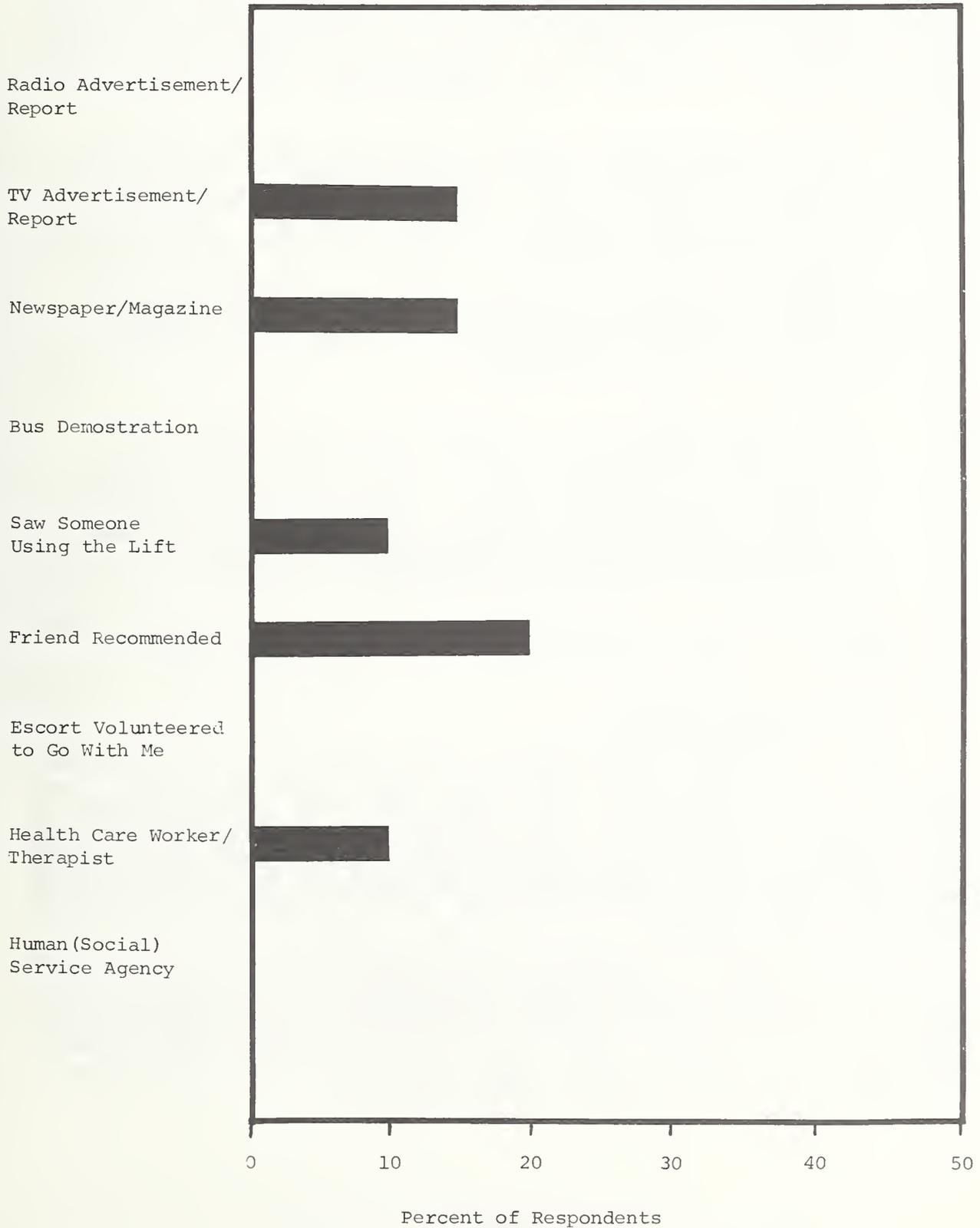


Figure 6-11

WHAT MOST INFLUENCED LIFT-USERS TO USE THE LIFT-BUS

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clearly indicate greater travel independence and less need or desire to use lift-equipped public transportation. Another difference is the greater likelihood of orthopedic impairments among lift-users as compared to other disabilities such as spinal injuries and disabling infirmities, more characteristic among non-users.

The overall picture that emerges is that lift-users are significantly more transportation disadvantaged. Lift users in Palm Beach County bear a greater resemblance to the typical elderly or handicapped transit dependent individual (e.g., as described in the National Survey) than do the non-users. Several explanations for this difference between lift users and non-users can be postulated:

1. Palm Beach County has attracted disabled people to the area who can take advantage of the favorable climate and residential development pattern; that is, those who can drive and can afford automobiles. These atypical disabled people do not need the lift and make up the bulk of non-users. However, since the representativeness of the nonuser sample is questionable, it is difficult to conclude that the lift is serving the most transportation disadvantaged among the local disabled population. Perhaps there are a large portion of non-users who need transportation but were not surveyed.
2. Palm Beach County has an extraordinary gap between rich and poor. The wealthy can afford alternative travel means, including specially equipped automobiles; while the poorer, elderly and those who live alone have no alternative but the transit service. In other communities the users might be expected to include "choice" riders, those who have other means of travel but choose to use transit. In areas such as Palm Beach County, this is highly unlikely among the disabled.

Note that transit riders, in general, would be expected to be much more "captive" markets in Palm Beach County and other smaller urban areas than in larger cities.

#### 6.8.2 Lift-User Reactions

Many lift users are fairly dependent on the lift-bus -- 40% are reportedly unable to make their lift-trips by other means and only 25% have a car available that they can drive. The average user made almost one-third of his/her trips on CoTran. It is interesting to note that while all lift users have difficulty climbing stairs and many have other difficulties connected with travelling by bus, 35% said they can use non-lift buses. Lift users walk or wheel to the bus stop although about 30% need assistance both to get to the stop and to ride on the bus.

Most lift users have experienced increased mobility as a result of the service: 69% reported travelling more often and 50% travelling "very much" to new places and activities as a result of the lift bus. Lift-users rated the lift-bus service quality as "good" to "very good" and 95% of them indicated they would use the service again. When asked whether they would prefer a door-to-door service, the respondent group was split.

Major problems users have with the lift bus service involve getting to the bus in bad weather, the lack of shelters (several are still to be installed), the barriers posed by curbs and busy streets and denial of service due to inoperable lifts. Most lift users said they do not use the lift bus in the rain. Traversing curbs and streets was identified as a serious problem by over half of lift users. While the City of West Palm Beach has installed a number of curb cuts (ramps) in its downtown area, there has been no areawide coordinated program of curb cuts either before or during the demonstration program. Crossing streets is made more difficult by the fact that key bus routes often operate on major arteries with several lanes of traffic and without signals at many intersections.

Denials due to inoperable lifts appear to have been more common according to lift users than reported by CoTran. During the three-month period before the survey, six of the 20 lift-users surveyed reported being denied service, only half of whom remained to wait for another bus. Note that only thirteen lift-users reported making trips during the period, accounting for approximately 350 trips. During this same period, CoTran reported 390 trips but no denials of service.

Finally, lift users learned about the service primarily from television and newspapers. Less than half received training in how to use the lift bus, mostly from sources other than CoTran. Training was rated "very helpful" by those who received it.

#### 6.8.3 Non-User Reactions

Non-users were quite aware of the lift service, learning about it from television and newspapers, as well as by word of mouth. Only 13% believe they are able to travel by regular bus and 95% said they would use the lift if travelling by bus. As many as 90% feel they are physically able to use the lift bus, although about half thought they would need some instruction in how to use it. Half of the non-users indicated that they plan to try the lift bus in the future.

With higher incomes than the surveyed lift users, and greater access to automobile based travel modes, the non-users surveyed apparently prefer alternatives to lift-bus service. Clearly, CoTran service, which is provided at a relatively low frequency on most routes and has only limited service in residential areas, is much less convenient than many other mode alternatives.

Environmental factors affecting bus stop access also appear to have played a significant role in discouraging lift use among a considerable portion of the surveyed non-user group. Non-users expressed great concern with the lack of curb cuts and sidewalks and with rough street surfaces, as well as the need to cross major streets to reach a bus stop. While these factors are also of concern to lift-users, the proximity of a bus stop to their residence appears to have been a significant factor in the decision of some users to try the service. More convenient bus stop locations (only 10% live within 1 block of a stop compared to 44% of users) would apparently encourage a considerable number of non-users to try the service as well.



# 7: OPERATOR PRODUCTIVITY AND ECONOMIC IMPACTS

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Key operator concerns relating to the use of lifts on fixed-route buses are whether increased fleet requirements and/or increased operating costs result. In particular, operators have been concerned about the effects of: increased dwell times on the schedules; increased driver duties on driver wage rates; lift malfunctions on spare vehicle requirements; and lift maintenance on operating cost.

This section examines each of the major potential productivity and economic impacts on the operator associated with the demonstration. The first three sections concentrate on lift utilization, fleet productivity, and labor issues. The final section investigates the cost implications of the demonstration services, including start-up costs and ongoing expenses related to both operations and support services.

It is not possible to make before/after comparisons of CoTran operating costs to examine the overall impact of the project since CoTran underwent major restructuring at the time of the introduction of lift service. Therefore, we will attempt to investigate impacts on each major cost component and then total the cost impacts due to the lift.

## 7.1 LIFT UTILIZATION

As discussed in Section 6, lift use during the demonstration was relatively low, averaging about 30 trips per week or about 6 trips per weekday. This means lift-users accounted for only about 0.04% of passenger-trips carried on the entire CoTran system.

The number of accessible one-way bus trips provided by CoTran ranged from 14,000 to 16,000 trips per month. At the highest monthly ridership level of 151 trips, the rate of lift use would be one lift trip for every 100 bus trips. One may estimate that the average CoTran driver would drive 2,000 miles or 135 hours between consecutive lift passengers. Since individual lift users made frequent trips on the same route at the same time of day, some drivers operated the lift much more frequently than others.

It should be noted that lift ridership figures were derived from driver counts, and it is believed that they may be subject to significant undercounting.

## 7.2 FLEET PRODUCTIVITY

The productivity of CoTran's fleet could have been affected by the project in several ways:

- Lift malfunctions could have increased out-of-service time and therefore required additional spare vehicles;
- Lift boardings could have increased dwell times substantially thereby requiring that additional time be added into the schedules and/or into layover times;
- Ridership could have increased substantially due to lift users and affected load factors. (This was clearly not an issue since lift usage was very low and without lift riders seating capacity was only marginally impacted.)

CoTran maintained a modest average spare ratio during the demonstration; just under 10% at the start and increasing to 19% at its end (as a result of service cutbacks). Although there were breakdowns of lift equipment which necessitated repairs and change-ups (substitutions) on the road, CoTran reported no significant in-service delays.

Layover times were increased as the project was initiated in order to correct for pre-project deficiencies and to serve as a cushion for possible delays due to the lift. The latter proved not to be a problem and, as the project progressed, layover times were reduced. Therefore, layover time effects are not included in the estimation of project costs.

## 7.3 LABOR ISSUES

The potential labor impacts of the demonstration were focussed on the drivers. At issue were the driver's attitudes towards the special equipment and the additional tasks the service would require, the union's position on extra pay for additional duties, the demonstration's impact on total driver hours and the effectiveness of the driver training program.

At the outset of the demonstration, there was concern that because lift bus drivers were required to go through a special training program, operate new equipment, assist passengers using the lift and participate in data collection activities, drivers might protest the additional workload as the demonstration progressed and demand extra pay. In order to avoid such difficulties, union representatives were consulted and included in the service planning process, and the training program was designed to emphasize the important social value of the project. As a result, driver cooperation was achieved and union negotiations proceeded without any problem.

To examine driver reactions to the lift service, driver surveys were planned as part of the evaluation effort and conducted during September 1980 and May 1981. The survey sample consisted of all of CoTran's 132 drivers; 117 responded to the first survey and 122 to the second. In addition to collecting data on driver opinions towards the accessible service, the surveys obtained first-hand information on driver operating experiences.

In general, drivers appear to be relatively unaffected by the accessible service, perhaps because its level of utilization has been so low. A few drivers are handling the bulk of the ridership. About half reported no lift boardings in the four weeks before the second survey; however, only one driver had never operated the lift in service.

Most drivers had few problems with the lift; the majority reported they had experienced difficulties either "a few times" or "never". As a result, over three-quarters of drivers rated the lift as reliable.

Most drivers reported that they have left their seats to assist passengers. About half did so frequently and at their own initiative. Nevertheless, the majority said the lift did not increase their workload. Both the awareness and operations training programs were rated valuable by the drivers. The majority did not see a need for refresher training.

The driver survey results indicated that most drivers support the lift bus project. About half of the drivers felt that the lift bus service has improved the transit property's image, while very few felt it had the opposite effect.

General monitoring of labor relations, which also indicated the lack of any significant driver reactions, supported these survey results. One can only speculate whether driver reactions would have been more significant if the service had attracted a larger ridership, particularly if the additional riders included individuals who require greater driver assistance.

## 7.4 COSTS

The costs associated with the demonstration project include start-up and ongoing expenses related to equipment and operations as well as administrative and support services and data collection. Much of the data collection and related administrative costs are due to the demonstration nature of the project and are not likely to be service costs in non-demonstration contexts. To the extent possible, distinctions are made between data collection and service-related costs in the ensuing discussion.

Demonstration funding covered most of the administrative and support service costs in addition to the cost of retrofitting the buses with special equipment. A separate UMTA capital grant provided funding for the new TMC buses. Note that all the costs of maintenance and repair services and additional lift-bus related labor were borne by CoTran (which receives federal operating aid). The UMTA demonstration grant budget and expenses are shown in Table 7.1.

### 7.4.1 Start-Up Costs

#### Capital Costs

The GMC buses were retrofitted with lifts and special seats, and later with accumulator devices and improved sensitive edges. These costs are shown in Table 7.2. The total cost in 1980 dollars was \$19,641 per bus or \$451,743 for all 23 GMC buses.

Table 7.1

## DEMONSTRATION COSTS

	Grant Budget	Charges to Grant	Explanation
Direct Labor	\$ 54,697	0	CoTran staff time was donated as in-kind services
Materials and Equipment	\$347,293	\$347,293	
Installation of Lifts and Seats	\$107,010	\$98,870	Cotran did not install all the equipment originally purchased
Information, Marketing, and Training*	\$140,000	\$136,935	
Survey and Data Collection Subcontracts	\$40,000	\$42,625	CoTran staff time was not charged.
	\$689,000	\$625,723	

\*Includes the cost of a training lift (\$9,307)

Table 7.2

## CAPITAL COSTS

	Cost per Bus	Year	\$1980
GMC Buses:*			
Lift	\$8,160	1977	\$10,861
Two flip-up seats	\$1,026	1978	\$ 1,241
Accumulator package	\$ 428	1978	\$ 518
Sensitive edge	\$1,848	1979	\$ 2,033
Installation of lift	\$3,225	1978	\$ 3,902
Installation of seats	\$ 342	1978	\$ 414
Installation of accumulator devices	\$ 471	1979	\$ 518
Installation of sensitive edge	\$ 140	1979	\$ 154
Total			\$19,671
TMC Buses:			
All special equipment (installed)	\$9,000	1979	\$ 9,900

\*Note that equipment for 30 buses was provided in the grant. Due to accidents only 3 spare lifts are now available.

The TMC accessible buses came lift-equipped from the factory. Thus the cost of the lift, flip seats and other special equipment was essentially the difference between the cost of an accessible and a regular bus of the same manufacture, or \$9,000 (in 1979 dollars). This totals \$396,000 for all 40 lift-equipped TMC buses, adjusted to 1980 dollars.

#### Staff Training

The driver training program consisted of two elements: handicap awareness training and technical training in how to operate the lift mechanism. All 108 operators underwent awareness training during 4 days in July 1979. The program required two hours and was conducted on the drivers' days off. Drivers were paid straight-time wages. Staff of local agencies and representatives of the local handicapped organization provided the instruction.

The technical training was provided to all operators beginning in August 1979 (before the first accessible route was initiated) and ending in October. CoTran supervisors and a TDT staff person provided this two hour program.

The costs of the program are shown in Table 7.3. The total cost was \$16,150 or \$150 per driver.

Mechanic training cost has been estimated at \$2100, consisting of 2 hours of training for each of 17 mechanics in a session led by TDT staff and about 5% of 2 class "A" mechanics' time in the following year.

#### Marketing/Outreach Costs

Because the accessible service implementation coincided with the introduction of major service changes unrelated to the accessible service, marketing costs associated with the project are difficult to isolate. CoTran spent \$192,000 on contracted marketing activities over the project period and has attributed \$122,000 (almost two-thirds) to the project. In addition, CoTran conducted field demonstrations at several community locations costing about \$2,400 in staff and vehicle time (see Table 7.4). It is believed that some of the marketing activities attributed to the demonstration served dual purposes; however no further disaggregation of these costs is available.

The ensuing discussion includes cost estimates for the major elements of the marketing program so that other transit authorities may be able to estimate the costs associated with the individual activities. Since other transit authorities who may implement accessible service may not be simultaneously restructuring their entire service, the fact that marketing costs are not allocated to several marketing purposes may be quite appropriate, even if in CoTran's case they represent a simplistic allocation of costs.

Table 7.4 shows the major elements of the marketing program and their costs. Note that the printing of pocket schedules and newspaper insert brochures constituted over 64% of the marketing expenses. Although the schedules and brochures included an illustrated description of the lift equipment and its use, it is difficult to attribute the total costs to the lift service and to extrapolate the results to other transit authorities.

Table 7.3

## DRIVER TRAINING COSTS

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(excluding development costs)

<u>Driver Time</u>	<u>Total Hours</u>	<u>Total Cost</u>
Sensitivity	216	\$ 2,200
Operations	216	\$ 2,200
Total		\$ 4,400
<u>CoTran Supervisor Time</u>		\$ 1,000
<u>TDT Staff Time</u>		\$ 1,450
<u>Agency Staff Time</u>		Donated
<u>Materials</u> (TDT Lift Mock-up)		\$ 9,300
TOTAL		\$ 16,150

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Table 7.4

## BREAKDOWN OF MARKETING EXPENDITURES

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Schedules	51,000	42%
Start of Services Insert Brochures	27,600	22%
Advertising	26,500	22%
Newsletters	4,900	4%
Slide Show	4,400	4%
Public Relations/News Releases/Media Contract	3,800	3%
Research and Planning	<u>3,800</u>	<u>3%</u>
	122,000	100%

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The remaining 50% of the budget represents several one-time costs (e.g., development of a slide show, research and planning costs for the marketing program, start-of-service advertising and publicity) and some ongoing expenses (newsletters, advertisements and publicity). It is estimated that start-up marketing costs constituted 90% of marketing and 100% of user training costs or \$112,200.

#### Administrative Costs

CoTran did not maintain detailed records of time spent on the demonstration project by its own staff members. Thus, it is not possible to report the cost of administration with accuracy, nor is it possible to separate out the additional level of effort required to administer data collection. CoTran management estimates that during the first year of the demonstration, in which plans were made for implementation and equipment was purchased, approximately 20% of the manager's time was expended on the project. In the second year when implementation activities took place (such as training, retrofitting, maintenance, etc.), about 10% of one supervisor's time was required in each of the maintenance and operations departments supplemented by about 2-3% of the manager's time. It is estimated that administrative costs amounted to about \$19,000.

#### 7.4.2 Ongoing Costs

##### Repair/Maintenance Costs

The monthly costs for maintenance, repair and parts averaged \$3205 or \$51 per bus.\* Maintenance and repair costs associated with the lift decreased substantially as the project progressed (see Figure 7-1). In the period from February to June 1981 when CoTran took over all maintenance activities the average was \$1654 per month compared with \$4299 in the period from June 1980 - September 1980 when CoTran did very little of the repair and maintenance work. While repair and maintenance hours decreased somewhat, this reduction in cost was largely due to the shift to responsibilities from the private contractor to CoTran's own staff. CoTran mechanics earn approximately \$9.10 per hour (including benefits) compared to hourly rates of \$25 charged by TMS.

Examining the one year period from July 1, 1980 to June 30, 1981, CoTran expended \$38,643 for maintenance, repair and parts, or \$613 per bus. This exceeds the costs reported in Seattle (\$497), but is well under the costs experienced in other locations such as Washington, D.C. and Milwaukee where nearly \$2000 was expended per bus. If CoTran had performed all maintenance and repair functions in-house for the entire year, one might estimate an annual cost of \$23,187 or \$368 per bus. This would be the lowest cost yet reported among the projects under study by the Transportation Systems Center.

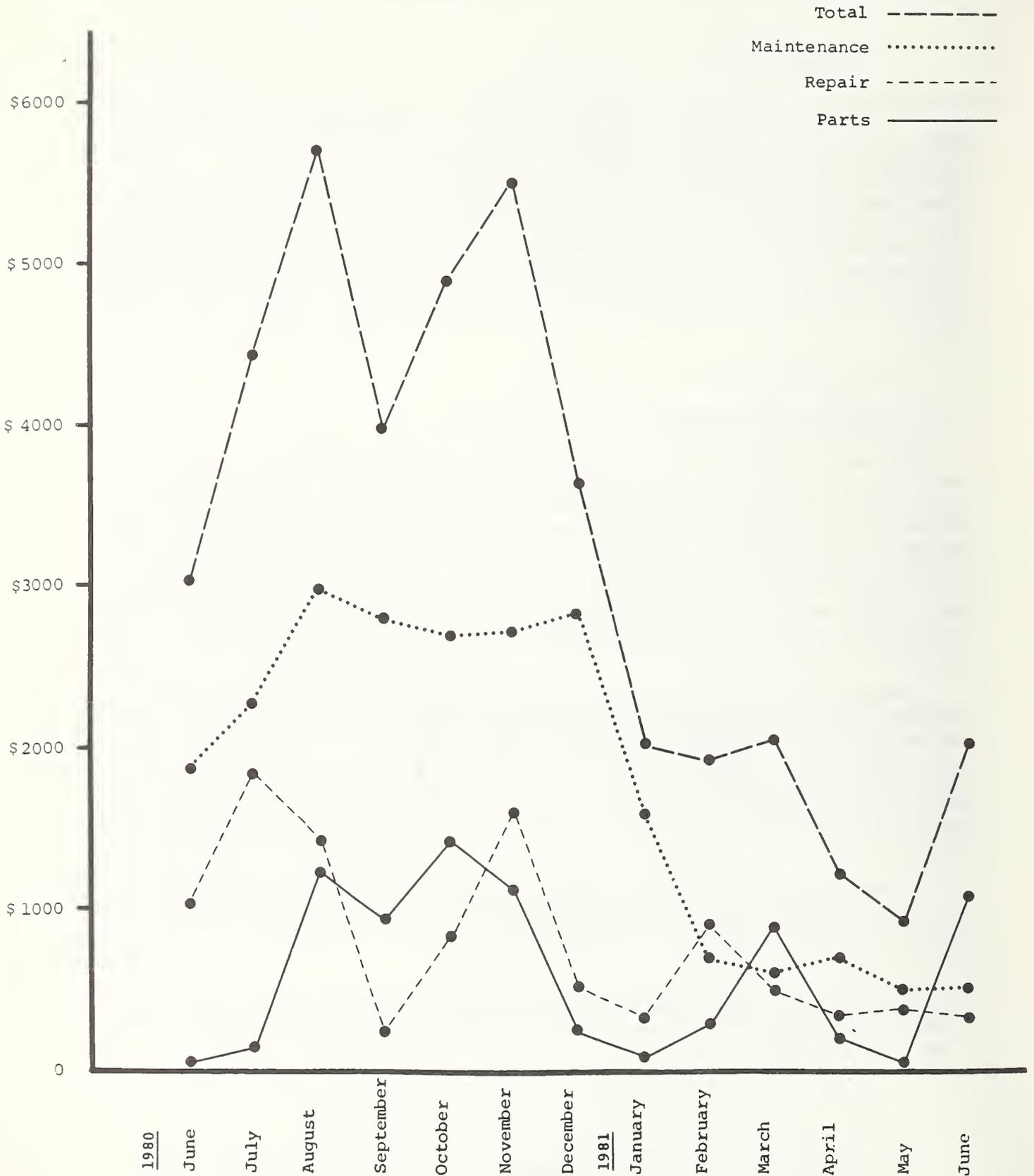
Because maintenance/repair costs decreased over the life of the project and ridership increased, the maintenance/repair cost per trip decreased from \$113 in July 1980 to about \$11 in April 1981.

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\* Excluding repair costs during May 1980 which included some retrofitting costs, and during July 1981 when a major accidental damage required replacing a lift.

Figure 7-1

MAINTENANCE, REPAIR AND PARTS COSTS



Note that all of the above figures exclude repairs performed under TDT's one year warrantee, which covered both parts and labor. Much of this work was performed directly by TMS (TDT's local representative) and billed directly to TDT. As a result, CoTran does not have an estimate of the costs associated with these repairs.

#### Accident Claims and Insurance Costs

There were no accident claims reported which related to the lift and no increased insurance premiums attributable to the demonstration.

#### Administrative Costs

Once the service was in operation, it is estimated that administrative costs involved 10% of the supervisor's time in the maintenance and operations departments plus a very small percentage of the manager's time. The manager's involvement was largely required for data collection activities and it is estimated that in the post-demonstration period the manager's involvement essentially ended, while the other staff members have continued to spend approximately the same amount of time as during the demonstration. Over the demonstration service period of approximately one year, it is estimated that \$6,000 in staff time was expended.

#### Marketing

Ongoing marketing activities included newsletters, news releases, public relations and some advertising. It is estimated that only about \$12,200 of the marketing cost would represent ongoing expenses on an annual basis.

#### 7.4.3 Data Collection Costs

Data collection involved CoTran staff time, administrative expenses and contractor costs. The surveys and diaries of county residents and disabled lift-users and non-users were performed by CoTran's survey contractor, Regional Research Associates. CoTran's marketing contractor, Fred Fetterly Associates, assisted with publicizing the survey efforts, printing forms and carrying out mailings. In addition to supervising the contractor efforts and playing a role in assembling the survey samples, CoTran staff conducted on-board surveys of regular riders, supervised bus reliability time-checks and distributed driver surveys. CoTran also was responsible for all record-keeping associated with the demonstration and transmitted detailed monthly reports on ridership and costs. These costs totalled \$42,625 plus staff administrative costs that cannot be isolated from general project administration.

#### 7.4.4 Cost Summary

Table 7.5 summarizes the costs of the accessible bus project excluding the costs of data collection. It is difficult to compute a single total cost that will be meaningful to other transit operators, primarily because the costs were not reported for a single time frame, and it is unclear how often some of the costs will recur. For example, the capital costs and support costs reflect costs that are recurring on a cycle of several years, while operational costs are an annually recurring cost. In some cases, a portion of the cost is a one-time expenditure. Therefore, we must make some assumptions and approximations to calculate annual costs and cost per trip.

If we assume a 10% turnover of drivers and a ten year life of the lift equipment, we can compute a cost of lift service on an annual basis (in 1981 dollars). As shown in Table 7.6, this totals \$238,572 of which \$151,763 represents capital costs amortized over 10 years. This results in a cost per lift trip of \$153 including capital costs and \$56 including only operating costs.

## 7.5 SUMMARY

It is evident that while the Accessible Bus Project did not have significant effects on schedules or drivers, it has been quite costly for the operator. The low level of utilization has been a factor in minimizing the former impacts but has kept per trip costs high. One can only speculate what the impacts of greater lift utilization might be for the operator. It is noteworthy that for per trip costs to be reduced to levels consistent with demand-responsive transportation (i.e., about \$12), ridership would have to increase more than ten-fold.

Table 7.5

### SUMMARY OF ACCESSIBLE BUS PROJECT COSTS

(excludes CoTran overhead)

#### Start-up Costs: (1980 Dollars)

Capital Costs	\$847,743
---------------	-----------

#### Support Services Costs

- |  |           |
|--|-----------|
| ● Mechanic training                    | \$ 2,100  |
| ● Driver training                      | \$ 16,150 |
| ● Marketing                            | \$109,800 |
| ● User training (field demonstrations) | \$ 2,400  |

Administrative Costs*	\$ 19,000
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#### Ongoing Costs (1980-81 Dollars)

#### Operational Costs

- |                           |                |
|---------------------------|----------------|
| ● Lift repair/maintenance | \$ 38,643/year |
| ● Accident claims         | 0              |

Administrative Costs	\$ 6,000
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<u>Data Collection Costs:</u> (1981 Dollars)	\$ 34,901
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\* Some of the administrative costs during the project implementation period were related to data collection; it is difficult to isolate that portion of the costs.

Table 7.6

## COST PER TRIP (1981 Dollars)

	Cost	Year	Life	Annual Cost	\$1981
<u>Start-up Costs:</u>					
Capital	\$847,743	1980	10	\$137,966	\$151,763
Driver Training	16,150	1979	10	2,628	3,180
Mechanic Training	2,100	1979	10	342	414
User Training	2,400	1979	10	391	473
Marketing	109,800	1980	10	17,869	19,656
Administration	19,000	1980	10	3,092	<u>3,401</u>
				Subtotal	\$178,887
<u>Ongoing Costs:</u>					
Operation	38,643	1980-81			40,575
Marketing	12,200	1980-81			12,810
Administration	6,000	1980-81			<u>6,300</u>
				Subtotal	\$ 59,685
TOTAL ANNUAL COST					\$238,572
ANNUAL COST PER LIFT-BUS					\$ 3,787
TOTAL OPERATING COST (EXCLUDING CAPITAL COSTS)					\$ 86,809
OPERATING COST PER LIFT-BUS					\$ 1,378
ESTIMATED ANNUAL LIFT RIDERSHIP (@ 30 TRIPS/WEEK)*					1,560
TOTAL COST PER LIFT-TRIP					\$ 153
OPERATING COST PER LIFT-TRIP					\$ 56
TOTAL COTRAN OPERATING COST (ADJUSTED TO 1981 DOLLARS)					\$6.1 MILLION
LIFT PROGRAM COST AS % OF ABOVE					3.9%

\* This ridership figure may be an underestimate due to undercounting of lift-trips by the drivers.



# 8: SUMMARY AND CONCLUSIONS

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This section summarizes the key results of the demonstration and presents conclusions that can be drawn regarding the value of full-fleet accessible fixed-route bus service. Results are described in the following areas:

- Equipment
- Planning and Implementation
- Service Quality
- Ridership and Travel Behavior
- Operator Impacts
- Transferability of Conclusions

## 8.1 EQUIPMENT

The lift and tiedown devices used in this demonstration were among the earliest designs of such special equipment. It was necessary to make modifications to the original equipment, at the outset of the project, in order to overcome several design flaws: the sensitive edge device was replaced by a flush "razor-edge" that wheelchair passengers could traverse more easily; an accumulator device was added to control the drifting of the lift from its stowed position; and stronger wheelchair securement clamps were substituted for the original ones which were considered unsafe. Some design flaws, however, could not be rectified without significant cost, such as the short lift platform and the clamp-type securement device, neither of which was designed to accommodate power-drive wheelchairs. Note that a survey of non-users, which may or may not be representative of the disabled population, indicated that 45% use power-drive wheelchairs. Despite the above difficulties, disabled people who had made use of the lift one or more times did not note major physical difficulties with the equipment.

The equipment has proved reliable insofar as the maintenance cost has not been excessive and the availability of lifts for service has been quite high. Although CoTran originally experienced high costs when it employed a contractor to perform routine maintenance and adhered to a strict preventive maintenance schedule, a subsequent shift to in-house maintenance and less frequent inspections resulted in maintenance and repair costs on the order of \$350 per bus per year (based on six months' data), among the lowest figures reported nationwide. While no resulting deterioration of service reliability has been detected to date, the long term effects of reduced preventive maintenance are unknown.

Several problems with the lift continued throughout the demonstration period including drifting of the lift platform, electrical and switch malfunctions, and leakage from the hydraulic lines. The retrofitted buses have proven somewhat more troublesome and latest reports indicate that the installation of the lift has weakened the bus frame sufficiently to cause structural problems.

## 3.2 PLANNING AND IMPLEMENTATION

The idea of equipping PBCTA (CoTran) buses with lifts was a recommendation of Palm Beach County's Citizen Advisory Board. The suggestion was made several years after the County transit system had absorbed into its regular routes a special transportation pilot project designed to transport State Health and Rehabilitative Service clients to their appointments. A portion of that service had originally operated with lift equipment, but the lifts had since fallen into disrepair. The County applied to UMTA for demonstration funding and became one of two test sites for full-fleet accessibility.

Although health and rehabilitation services had been a factor in generating the initial project concept, CoTran involved local disabled and human service organizations only minimally in the early planning of the project. Early consultations determined that disabled persons wished to board the bus in a manner similar to that of other passengers, to the extent possible. Consequently, CoTran selected front-door lift devices (manufactured by Transportation Design and Technology, Inc. of San Diego) and proceeded with the purchase of equipment and the implementation of service.

The major implementation activities included:

- retrofitting buses with special equipment;
- training drivers and other staff;
- marketing the service to potential users.

Due to a shortage of buses and severe maintenance problems, the retrofit program proceeded slowly, extending over two years. Due to the deteriorating condition of the fleet, changes were made to the demonstration plan to reduce the number of older buses to be retrofit and to purchase new factory-installed lift-buses instead. As the first lift-buses became available for use, CoTran determined that modifications would be needed to correct design flaws.

Training of all CoTran drivers took place during a four month period beginning with handicap awareness training in July 1979. This program involved participation by several local disabled and human service organizations and was rated highly by all participants. The program involved role-playing and discussion and was carried out only once; CoTran intends to utilize George Washington University's training program (developed for WMATA) in the future, since its audio-visual materials will make it easy to conduct awareness training on an ongoing basis as new employees are hired.

Technical skills training took place in October 1979 and included the participation of TDT (the lift manufacturer) personnel. The two hour session included classroom instruction and on-the-road practice. Because delayed implementation resulted in a long time span between training and actual

operation of the lifts for passengers, it was necessary to issue reminder memoranda on operational procedures and to check driver skills from time to time. All of the driver training activities were mandatory and drivers were paid for training hours.

Training of mechanics was performed with the help of the lift manufacturer and the maintenance contractor. The use of a maintenance contractor in the early stages of the demonstration, although quite costly, enabled CoTran to slowly bring its mechanic staff up to speed. Once contracted lift maintenance was discontinued, an additional mechanic was needed.

Marketing was a major element of the demonstration project and expended almost 20% of the grant budget. While several field demonstrations of the lift were performed early in the project, most of the effort went into advertising and promotion via print and broadcast media. The use of the term "fully accessible to the elderly and the handicapped" in the initial advertising media caused considerable dissatisfaction in the disabled community due to the fact that the lift and tiedown equipment did not accommodate power-drive wheelchairs.

Lift service marketing was performed by CoTran's regular marketing contractor, and took place during a major restructuring of the entire County transit system which included its own promotional campaign. There was undoubtedly interaction between the two marketing efforts. It is widely believed locally that the marketing program was very effective in informing potential users about the lift service, a fact borne out by survey results. However, since many non-users thought they would need instruction in how to use the lift, it is possible that a greater portion of the marketing funds would have been better allocated to consumer training efforts. Greater involvement of human service agencies and disabled community organizations in this effort might also have been useful.

The implementation of accessible service involved few service changes. Routes and bus stops were not affected by the lift project (a design decision, to some extent) and schedule modifications proved to be unnecessary at the ridership levels experienced, except where they were needed for other reasons. Operating policies related to the lift originally restricted lift use to wheelchair-users and required that the wheelchair be able to utilize the locking device. While these policies were instituted to restrict harmful effects on service quality and to insure the safety of the wheelchair user and other passengers, it was later determined that they unnecessarily limited the use of the lift and were therefore changed. No negative impacts have been reported since the policy change.

CoTran underwent many exogenous changes during the implementation period, changes which transformed the bus operation into a modern system with a much improved image. CoTran successfully put into reliable operation new buses and lifts, motivated and trained drivers, and informed the target market of the availability of the new service. Despite these accomplishments, it failed to maintain good public relations with the local organization of disabled people dedicated to accessibility and to rally the efforts of local human service agencies to help make the project a success.

### 8.3 SERVICE QUALITY

The CoTran bus system serves a large area of widely varying character. Most routes operate on the major arterials of coastal communities which do not have very high residential densities. Service is provided primarily during daytime hours and operates at relatively long headways (20 minutes or longer). As a result, despite full-fleet accessibility, CoTran does not offer the potential lift-user a very convenient means of travel.

The low frequency of service has important implications in the event of a service denial due to an inoperable lift or an occupied wheelchair location. CoTran's records indicate that only a small percentage (1.6%) of trips were denied service. Nevertheless, a fairly substantial portion (38%) of the small number of users interviewed indicated that they had experienced denials and half of these individuals did not remain to wait for a second bus.

The problems with the lift-bus most frequently noted by surveyed users related to getting to and waiting for the bus, followed by service denials. Only a few users indicated that they had physical difficulties with either the lift or the tiedown devices or fears about using the lift-bus. Similarly, non-users felt the single most important improvement needed was "more and better located bus stops."

While the demonstration has shown that lift-bus service is feasible, questions remain as to the adequacy of the fixed-route concept for disabled travellers. It is possible that in other larger communities, many of the most significant problems experienced in Palm Beach County would not arise, at least in the portions of the service area with dense transit networks, high frequency service and a large number of bus shelters. However, it may not be possible to overcome these difficulties in Palm Beach County.

While it was expected that safety and security would be major concerns of disabled users and non-users, this was generally not the case. Over the course of the demonstration, few passenger accidents involving lift boardings occurred and there were no reported problems with the security of lift passengers. While the lack of significant fears regarding physical safety may be a result transferable to other locations, it is to be expected that greater concern about personal security might be the case in areas where street crime is a greater problem or where nighttime travel is involved.

The introduction of lift service on CoTran's entire route system constituted a major increase in the availability of transportation for wheelchair disabled people in Palm Beach County, particularly since the only other general purpose lift-equipped transportation service for those under 60 years of age is much more costly to the user. It appears, however, that despite the physical feasibility of the service concept, it did not prove to be a convenient means of travel for the vast majority of disabled people.

Finally, the project had little (negative) impact on the service levels offered to able-bodied riders. This result is largely due to the low lift ridership; data on dwell times indicate that if there were substantial increases in lift ridership, service reliability for other passengers might be affected.

## 3.4 RIDERSHIP AND TRAVEL BEHAVIOR

Although there was substantial growth in lift ridership over the demonstration period, the number of lift trips made using the lift never reached a significant number. At its peak which occurred during the height of the 1981 winter season, there were 151 lift boardings representing a tiny 0.04% of total trips and only 3.4% of trips made by handicapped individuals (using reduced fare identification cards). Driver lift-trip logs indicate that 10-20 individuals may have been responsible for the trips recorded during any given month. (Thus, there may not have been many more users than the 20 interviewed in the survey.) While the surveys indicated that trips by some users were not included in the drivers' ridership count, it is very unlikely that the number of lift trips reached 1% of total transit trips (by all passengers).

CoTran originally permitted only wheelchair users to use the lift. It was expected that large numbers of elderly bus riders might want to use the lift, particularly since CoTran's buses do not have a kneeling feature. While the policy was later modified to allow ambulatory disabled to use the lift, the change was never widely advertised. In March 1981 when total lift ridership was at its peak, ambulatory lift-users accounted for only 10% of all lift boardings reported.

The fact that the lift was not designed for power-drive chairs may also have substantially reduced ridership potential since indications are that nearly half the wheelchair population uses power-drive chairs and that they might find it easier to get to the bus stop.

Although the lift-users and non-users were found to be similar in several respects (e.g., sex, percent age 55 and over, degree of agency affiliation), the lift-user group tended to have lower incomes, less access to automobiles (either with or without special adaptive equipment), and were more likely to live alone and to have orthopedic impairments. In general, lift-users appeared to be more transportation-disadvantaged than the non-users. However, due to some uncertainty about the representativeness of the non-user sample, it is difficult to conclude from these results that the lift-bus is indeed serving the most transportation-disadvantaged among the disabled population.

The small number of users were fairly dependent on the lift-bus, on average making almost a third of their trips on the bus; many indicated they were unable to make these trips by other means. In their own estimation, the service increased their mobility, and almost all intended to continue to use it. Nevertheless, it is important to note that the lift has not enabled all of these users to travel independently; nearly one-third of users require assistance from an escort to get to the bus stop or to ride the bus.

Disabled non-users were quite aware that the lift-bus service was available, but generally preferred to use other travel means. Although most surveyed non-users (87%) believed they were unable to travel by regular bus, almost all thought they could use the lift-bus. In fact, about half of the non-users indicated they would ride the lift-bus in the future.

While auto availability (either as a driver or passenger) played the key role in mode choice for non-users, the issue of access to the bus stop was also quite important. Non-users lived at greater distances from the bus stop and considered closer location of bus stops to be the primary improvement needed. They also expressed great concern over difficulties they perceived that they would have in getting to a bus stop, specifically the barriers posed by curbs, major streets and poor street and sidewalk conditions. The potential problems identified by non-users were also among the important problems experienced by users.

It appears that without increasing the service frequency and route density, embarking on a program to reduce environmental barriers to wheelchairs, and modifying the lift platform length to accommodate power-drive chairs, there is little potential for increasing use of the fixed-route lift-bus by the disabled in Palm Beach County. Since the survey also revealed that total trip rates by lift-users are currently equal to those of non-users, who largely have automobile alternatives, there is doubt that significant additional potential ridership for any public transportation service for the disabled exists. Perhaps disabled people have less desire to travel due to limited activity (e.g., employment, recreation) opportunities; over the long term, with increasing accessibility of the environment, their demand for tripmaking could increase.

While the local disabled community is in favor of accessible fixed-route transit, it recognizes that the trip to the bus stop is a significant barrier that must be addressed. Suggestions have included feeder service to the bus and door-to-door services. CoTran management is currently a proponent of door-to-door services to meet the needs of disabled people.

### 3.5 OPERATOR IMPACTS

The accessible bus project had little effect on CoTran schedules, driver hours or pay scales, or total fleet requirements. The essential operator impacts were the start-up costs associated with equipment, training and marketing, and ongoing maintenance costs. These costs have been substantial, particularly when calculated on a per trip basis, since ridership was so low.

Retrofitting older buses cost approximately \$19,641 per bus, while the additional equipment added \$9,900 to the cost of each new bus (all adjusted to 1980 dollars). Thus the equipment costs for the total fleet were \$848,000. Training drivers cost \$150 per driver for a total of \$16,000. Mechanic training cost an additional \$2000. Expenses for marketing and outreach were about \$112,200. Administrative costs during start-up totaled approximately \$19,000. Thus the total start-up costs were \$997,200.

Ongoing operating expenses were primarily maintenance costs which were about \$37,000 per year or \$600 per bus. Ongoing administrative costs totalled \$6,000 per year and marketing expenses \$12,200.

Annualizing the start-up costs over a 10-year period, the annual total operating cost of lift service is \$236,693 or \$3,761 per bus. The resulting per trip cost (including vehicle purchase costs) is \$152. Note that this is 10 times the per-trip costs experienced in Seattle where ridership was about

15 times higher. On the other hand, the Palm Beach costs are less than half that experienced in Washington, D.C. where ridership was nearly equal on a per-bus basis.

### 3.6 TRANSFERABILITY OF CONCLUSIONS TO OTHER APPLICATIONS

Palm Beach County in many respects offered ideal conditions for a demonstration of accessible bus service. With a large elderly population, a mild climate and a flat terrain, it was expected that there was great potential for ridership. Demonstration results indicate that the transit service levels and lack of curb cuts overshadowed these beneficial aspects of the site.

Several particular events and characteristics of the project environment may also have played a role in shaping demonstration results. On the negative side, these include the following:

The disabled community was never involved to a great degree in the project. The fact that this important resource was overlooked may have reduced the potential for improving the service design (e.g., equipment selection, route changes) during the early phases and for marketing the service once it was in place.

The project was put into full operation at a point in the season in which CoTran ridership typically drops. Perhaps much of the momentum of the marketing effort was lost due to the timing.

The project utilized an early model lift which could not properly accommodate power-drive chairs. The inability of many power chair users to use the lift may have seriously decreased potential ridership, particularly since power chair users are a large and increasing portion of the wheelchair market and are possibly the most likely to be able to travel a substantial distance to a bus stop.

The service obtained harmful publicity. Despite good coverage of the project's implementation progress and the advent of the new "CoTran" service, several articles decried deficiencies in the equipment problem design and highlighted problems and disagreements between the disabled and the transit authority. This publicity could have discouraged ridership.

On the positive side:

CoTran experienced low operating costs compared to other sites. Due to its location and its open shop, CoTran was able to take advantage of lower than average wage rates. This helped to keep costs down on a per-bus level. Of course, low ridership still caused per-trip costs to be rather high.

CoTran maintained a reliable service and kept disruption of service to other passengers to a minimum. Carrying out intensive preventive maintenance probably contributed to a low incidence of vehicle breakdowns. Combined with low ridership, the resulting effect was little or no disruption in service to able-bodied riders.

Despite these site- and project-specific influences, the results of this demonstration should be largely transferable to other communities with similar site and transit service characteristics. That is, in areas with 1) low density development; 2) low frequency transit service with limited coverage in residential areas, and 3) slow progress in making streets and sidewalks accessible, only minimal lift bus ridership can be expected. However, in areas with dense transit networks, high density development and extensive curb cut programs, greater ridership might be expected.

Since the Palm Beach project is one of many implemented in the past few years, we can already observe differences in results. Only a few sites where accessible bus service has been implemented have experienced vastly different results in terms of ridership or cost. Contrasting most sharply with the experience in Palm Beach County was that of Seattle Metro. Seattle had the largest vehicle ridership yet reported, although smaller systems in Eugene (Oregon) and Johnstown (Pennsylvania) have had a larger number of riders on a per-bus basis. Seattle experienced about eight times the per-bus ridership in Palm Beach County, despite the fact that only partially accessible service was provided. While Seattle's rainy climate and hilly terrain could not have worked in its favor, the evaluation of the Seattle project attributed the high ridership to several aspects of the project. These included: (1) good service planning and marketing; (2) commitment on the part of Metro; (3) the strong support and participation of the handicapped community; and (4) a lack of any major competing accessible service. While the Palm Beach project differed in some of these respects, the transit environment in which the service was implemented must be considered a major factor. Seattle's transit ridership is much larger on a per bus basis than Palm Beach's. Viewing lift ridership as a proportion of total riders, the contrast dims. Seattle's proportion of total riders using the lift was .07%, almost twice the level in Palm Beach, .04%. Considering the fact that about half of Seattle's users used power-drive wheelchairs, and that power chairs generally cannot use the Palm Beach lift, we see that the contrast between these two projects is not as great as it first appears, when viewed in the context of total bus ridership.

In terms of annual operating cost per bus (including amortization of start-up costs), Palm Beach experienced costs 29% higher than the costs in Seattle. This is primarily due to higher start-up marketing costs in Palm Beach (a design decision). In terms of maintenance and repair costs, the projects yielded fairly similar results. It is the difference in ridership that creates a sharp contrast in operating costs per trip: \$56 per trip in Palm Beach vs. \$8.30 in Seattle. Another large difference is in the capital cost per bus where Palm Beach experienced twice the costs, due to higher lift purchase costs and, to a greater degree, the higher costs of retrofitting buses as opposed to purchasing new lift buses. The fact that Seattle has a larger lift bus service may also contribute to lower unit costs.

Another project undertaken at about the same time as the Palm Beach accessible bus demonstration was the Washington, D.C. project. Due to poor reliability, ridership in Washington was approximately similar to that in Palm Beach despite the fact that Washington had 2.5 times the number of buses and a metropolitan area of greater density. In Washington, only partially accessible service was offered, but frequency of service on many routes was actually similar to that offered in Palm Beach. Due to excessive maintenance costs, 3.5 times the costs per bus in Palm Beach, the operating cost per trip in Washington was \$227, or more than four times the Palm Beach figure.

Overall, Palm Beach has experienced somewhat lower than average costs and average to above average ridership, when compared to other projects. A truly comparative analysis would require consideration of various transit and area characteristics.



Appendix A  
OPERATOR GUIDELINES



# BULLETIN

#126

JANUARY 21, 1980

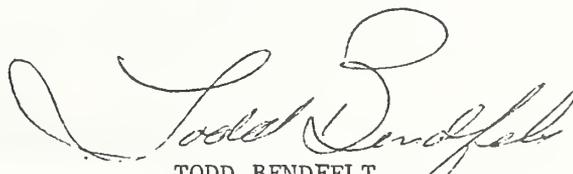
ATTENTION ALL OPERATORS:

SUBJECT: WHEEL CHAIR LIFTS

IT HAS BECOME EVIDENT, THAT MANY OPERATORS ARE HAVING TROUBLE OPERATING THE WHEEL CHAIR LIFTS. ALL OPERATORS HAVE BEEN TRAINED TO OPERATE THE LIFT AND SHOULD BE ABLE TO DO SO.

A STEP BY STEP INSTRUCTION SHEET WILL BE ISSUED TO EACH OPERATOR. ALSO, OPERATORS PULLING ROUTE 3 AND 800 SERIES BUSES OUT OF THE BARN ARE REQUIRED TO FULLY ACTIVATE THE LIFT, OUT-UP-DOWN-STOW AS PART OF THE DAILY BUS CHECK. FAILURE TO DO THIS WILL RESULT IN DISCIPLINARY ACTION.

ANYONE NEEDING FURTHER ASSISTANCE IN THE OPERATION OF THE LIFT, WILL CONTACT TODD BENDELT.

  
TODD BENDELT  
SAFETY SUPERVISOR

TB/bj

WHEEL CHAIR LIFT OPERATION

- I. PROCEDURES TO BE FOLLOWED WHEN OPERATING WHEEL CHAIR LIFT.
  - A. ENGINE MUST BE RUNNING AND AIR PRESSURE MUST BE BUILT UP TO AT LEAST 100 PSI.
    1. EMERGENCY BRAKE ENGAGED.
    2. TRANSMISSION IN NEUTRAL.
    3. FAST IDLE SWITCH ON. (800 series only)
      - A. LIFT WILL NOT OPERATE WITHOUT ABOVE PRELIMINARY PROCEDURES ACTIVATED.
  - B. ACTIVATING LIFT.
    1. MASTER SWITCH ON.
      - A. RED AND GREEN LIGHT WILL COME ON. (800 series only)
      - B. WAIT FOR RED LIGHT TO GO OFF. (800 series only)
        1. 400 & 500 BUSES HAVE ONLY ONE RED LIGHT NO GREEN LIGHT. OPERATE WITH RED LIGHT ON.
    2. PLATFORM OUT.
    3. SAFETY DOOR UP. (LIFT WILL NOT OPERATE WITH SAFETY DOOR DOWN ON 800'S)
    4. LIFT UP OR DOWN.
    5. SAFETY DOOR DOWN.
    6. LOAD WHEEL CHAIR
      - A. WARN PASSENGER TO LOCK WHEELS.
      - B. WARN PASSENGER TO KEEP ARMS IN.
    7. SAFETY DOOR UP.
    8. LIFT UP OR DOWN.
    9. PUSH STOW BUTTON.
      - A. LIFT UP OR DOWN UNTIL IT STOPS AUTOMATICALLY IN STOW POSITION.
    10. SAFETY DOOR DOWN.
    11. PLATFORM IN.
    12. MASTER SWITCH OFF.
    - ~~13. FAST IDLE SWITCH OFF.~~
    14. CYCLE COMPLETED.
- II. MOVING LIFT UP OR DOWN, WITHOUT PLATFORM EXTENDED.
  - A. SAME PRELIMINARY PROCEDURES MUST BE USED.
    1. EMERGENCY BRAKE ENGAGED.
    2. TRANSMISSION IN NEUTRAL.
    3. FAST IDLE SWITCH ON. (800 series only)
  - B. PUSH BY PASS BUTTON AND HOLD.
    1. LIFT UP OR DOWN.
  - C. KEEP LIFT FROM DRIFTING DOWN AND HITTING GROUND WHILE BUS IS IN MOTION. IF LIFT DRIFTS DOWN, DOOR ON BOTTOM OF LIFT WILL SCRAPE GROUND, CAUSING DAMAGE.
- III. SENSITIVE EDGE SAFETY DEVICE.
  - A. LIFT WILL NOT OPERATE WHEN SENSITIVE EDGE HAS BEEN TOUCHED. (800 series only)
    1. REACTIVATE LIFT BY MOVING SWITCH (BEING USED) IN THE OPPOSITE DIRECTION. THIS WILL RESET CIRCUIT BREAKER.
      - A. ON 400 & 500 SERIES, USE BY PASS BUTTON
- IV. OPERATORS ARE TO FULLY ACTIVATE LIFT ON ROUTE 3 BUSES, AND ON ALL 800 SERIES BUSES AS PART OF PULL OUT PROCEDURE, EVERY TIME A BUS IS PULLED OUT OF THE BARN.
  - A. MALFUNCTIONS WILL BE REPORTED IMMEDIATELY.

# BULLETIN

#154

JULY 9, 1980

ATTENTION ALL OPERATORS: RE: ELDERLY & HANDICAPPED ACCESSIBILITY

EFFECTIVE IMMEDIATELY, IN ADDITION TO WHEELCHAIR PASSENGERS, THE WHEELCHAIR LIFT WILL BE USED FOR PASSENGERS WITH WALKERS, CANES, CRUTCHES, OR FOR PASSENGERS THAT CAN NOT STEP UP HIGH ENOUGH TO REACH THE FIRST STEP WHEN BOARDING, OR CAN NOT STEP DOWN TO THE GROUND WHEN ALIGHTING WHERE THERE IS NO CURB.

WHEN THERE IS NO CURB, AND THE PASSENGER NEEDS TO USE THE LIFT, THE FOLLOWING PROCEDURE WILL BE USED. OPERATORS WILL SECURE BUS AND LEAVE SEAT TO OPERATE LIFT.

BOARDING: PASSENGER WILL BE TOLD TO STAND BACK UNTIL STEPS ARE LOWERED. WHEN STEP IS LOWERED TO ABOUT ONE INCH FROM THE GROUND, PASSENGER WILL BE TOLD TO STEP ONTO FIRST STEP, FACE THE OPERATOR, AND HOLD ONTO THE HAND RAILS WITH BOTH HANDS. ( PACKAGES WILL BE HANDED TO OPERATOR BEFORE BOARDING). PASSENGER WILL NOT TRY TO STEP UP UNTIL THE LIFT HAS STOPPED.

ALIGHTING: AFTER DOORS ARE OPEN THE PASSENGER WILL BE TOLD TO STEP DOWN TO THE BOTTOM STEP, TURN AROUND AND FACE THE OPERATOR, HOLD ON TO THE HAND RAILS WITH BOTH HANDS ( PACKAGES WILL BE HANDED TO THE PASSENGER AFTER ALIGHTING). PASSENGER WILL NOT TRY TO STEP DOWN TO THE GROUND UNTIL LIFT HAS STOPPED. PASSENGERS WITH WALKERS WILL BE LOADED IN THE SAME MANNER AS PASSENGERS IN WHEELCHAIRS, WITH THE PLATFORM FULLY EXTENDED.

WHEN USING THE LIFT, OPERATORS WILL GIVE VERBAL INSTRUCTIONS TO PASSENGERS AS TO HOW TO HOLD ON TO BOARD OR ALIGHT SAFELY.

OPERATORS WILL ALSO ASSIST PASSENGERS HOWEVER NEEDED TO INSURE SAFE BOARDING AND ALIGHTING.

OPERATORS WILL CAUTION PASSENGERS OF THE FOLLOWING WHEN USING THE LIFT:

- 1 - STAND CLEAR OF BUS UNTIL LIFT STOPS
- 2 - STAND ON STEP OR PLATFORM AND DO NOT TRY TO STEP UP OR DOWN UNTIL THE LIFT HAS STOPPED
- 3 - HOLD ON TO HAND RAILS WITH BOTH HANDS (PACKAGES WILL BE GIVEN TO OPERATOR BEFORE BOARDING, AND WILL BE GIVEN TO THE PASSENGER AFTER ALIGHTING)
- 4 - WATCH OUT FOR SAFETY DOOR ON THE PLATFORM - STAND CLEAR OF IT
- 5 - WARN PASSENGER THAT THE LIFT MOVES SUDDENLY AND TO HOLD TIGHT

OPERATORS WILL ACCOUNT FOR EACH TIME THE LIFT IS USED ON THE BACK OF THE OPERATORS REPORT CARD. OPERATORS WILL MARK THE BACK OF THE CARD AS FOLLOWS:

SEE SAMPLE CARD

IT IS IMPORTANT THAT OPERATORS RECORD THE TIME IT TAKES TO LOAD AND UNLOAD PASSENGERS WITH LIFT. WE NEED TO KNOW HOW MUCH THE SCHEDULE IS BEING INTERRUPTED!

"THINK SAFETY FIRST"

# INTERNATIONAL

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Appendix B  
MARKETING MATERIALS





# Palm Beach County Transportation Authority Newsletter

Vol. 1 - No. 1

September 1979

## Full Program Underway for Handicapped and Elderly

A program which will provide fully accessible bus service to the handicapped and elderly on county buses is expected to get underway October 1 in Palm Beach County.

Made possible by a federal demonstration grant of \$689,000, the pilot project provides for the entire fleet of buses operated by the Palm Beach County Transportation Authority to be equipped with wheelchair lifts.

A retrofit program is now underway at Dan Burns Oldsmobile in Delray Beach. It provides for the installation of wheelchair lifts and two special lock-in devices for seating on each bus. A total of 21 buses from the county fleet are being retrofitted now.

Palm Beach County was selected as one of two bus systems in the United States to receive funds under the demonstration grant. The other is in the Champaign-Urbana section of Illinois.

Following driver training, the fully accessible program for the handicapped and elderly will begin Monday, October 1. Irving Cure, resident manager, said, "We expect to start the program on Route 3 and make the entire system accessible to the handicapped by early 1980."

In addition, 40 smaller new buses equipped with wheelchair lifts and special equipment are expected to be delivered by March 1, 1980. This will give the county a total of 61 buses totally accessible to the handicapped and the elderly.

The grant, awarded to the county by the Urban Mass Transportation Administration (UMTA), covers the period ending September 30, 1980. The project calls for various surveys, exploration of fiscal aspects in changing the types of bus service, recommendations to solve problems of the severely handicapped, general utilization of the system and an extensive marketing program.

In addition, UMTA consultants

(continued on Page 2)



**Full Accessibility** — Rider on wheelchair is lifted on ramp so he can back his wheelchair onto bus.

## Service Agencies Participating in Program

Various agencies, including the United Way and its participating groups, are cooperating with the county's pilot program to provide full accessibility on buses for the handicapped and elderly.

Among those agencies available to assist with the implementation of the

transit program, scheduled with the merger of buses retrofitted with wheelchair lifts and special seating:

Florida State Division of Vocational Rehabilitation, County

(continued on Page 2)

## Palm Beach County Transportation Authority

County Commissioners serve as the Transportation Authority with jurisdiction over the bus system and county-operated airports.

Current Commissioners include:  
Chairman Bill Bailey, District 5  
Vice Chairman Dennis Koehler, Dist.3  
Mrs. Peggy Evatt, District 1  
Frank Foster, District 2  
Norman Gregory, District 4

Published for the  
Palm Beach County  
Transportation Authority  
By Fred A. Fetterly  
& Associates  
Public Relations - Advertising  
1675 Palm Beach Lakes Blvd.  
West Palm Beach, Florida

## Health Agencies Participating

(continued from Page 1)

Home and General Care Facility, Palm Beach Habilitation Center, County Health Department, Palm Beach Crippled Children's Society, Community Mental Health Center, Visiting Nurses Association.

Visiting Homemakers Association, Division of Family Services, Volunteer Agencies, VAC and RSVP; Goodwill Industries, County Department of Human Resources, Paralyzed Veterans of America, Veterans Administration, Community Action Council, Medical Services of Palm Beach County, Widetracks of West Palm Beach, Division of Retardation.

Multiple Sclerosis Society, Cerebral Palsy Association, RAF Industries, Housing and Urban Development, Division of Aging, Senior Citizens Council, Project Outbound and Epilepsy Foundation.

(EDITOR'S NOTE: Other agencies wishing to help with the program and be placed on the newsletter mailing list should contact the publisher, Fred A. Fetterly and Associates, West Palm Beach 684-0800).

## Program Underway for Handicapped

(continued from Page 1)

single out the following as "among the important issues" to be addressed by the demonstration program:

— The impact of fully accessible fixed-route transit on the mobility and lifestyles of the elderly and handicapped.

— The impact of the lift equipment and its use of the service provided to current transit users.

— The contrast between the demonstration's approach to the problem and the alternate approach of separate specialized transportation services for the elderly and handicapped.

Service and Methods Demonstration objectives, also pointed out by the UMTA consultants, single out a "primary focus" for Palm Beach County. In summary, the UMTA report notes the county's demonstration project will attempt "to improve the mobility of handicapped persons by equipping vehicles with lifts to enable handicapped persons, particularly wheelchair users, to board regular transit vehicles which provide fixed-route service."

Various county agencies, dealing with the elderly and handicapped, are being asked for input into the upcoming program.

## Marketing Efforts to Provide Information to Handicapped, Elderly

A comprehensive marketing program is underway in conjunction with the pilot project for full accessibility to the handicapped and elderly on county buses.

Fred A. Fetterly and Associates, a public relations and advertising firm of the Palm Beaches for 15 years, has been retained by the County Transportation Authority with approval of the national Urban Mass Transportation Administration to handle the marketing effort.

Fetterly, president of the firm, explained that the marketing program is designed to make every handicapped and elderly person in Palm Beach County aware that the Authority will have buses equipped with special equipment to provide full accessibility on the system's fixed routes.

"The marketing program also will inform all county residents about the federally funded project," he said.

In addition to this newsletter and others, the program calls for:

— Printing of special bus schedules for the handicapped and elderly.

— Production of a slide film with sound track explaining how buses are equipped for the handicapped and how the equipment works.

— A speakers bureau, with speakers available to appear before service agencies, civic clubs, doctors' groups and nursing homes.

— Public service programs on television and radio.

— General public relations and public information efforts through newspaper articles, radio and TV interviews.

— Use of billboards in the Greater West Palm Beach market.

— Bus signs.

— Training programs at large shopping centers so that handicapped persons may see how the special equipment is used.

— A brochure, with pictures, showing all facets of the fully accessible system to the handicapped and elderly.

— Direct mail informational letters to keep the various agencies and nursing homes abreast of progress.

— Posters for distribution to shopping malls and rehabilitation centers.

# Move to Provide Full Accessibility Began More Than Two Decades Ago

The pilot program which will make it possible for wheelchair-confined persons and the elderly to use all Cotran (Palm Beach County Transportation Authority) buses stems from a series of developments which began two decades ago.

The cry by the handicapped to be able to use public transportation was an extension of the civil rights movement which began in the early 1960's.

Congress made its move to support the handicapped and the elderly in 1964 when it passed the Urban Mass Transportation Act.

The act stated: "It is hereby declared to be the national policy that elderly and handicapped persons have the same right as other persons to utilize mass transportation facilities and services..."

In 1973 Congress passed even more powerful legislation for the elderly and handicapped when it passed the Rehabilitation Act of 1973.

Stated in section 504 of this act is the provision that: "No otherwise qualified handicapped individual...shall solely by reason of handicap, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal assistance."

In 1976 the Department of Health, Education and Welfare was directed to coordinate the implementation of Section 504 and all federal agencies were ordered to issue regulations on the subject.

The next year Transportation Secretary Brock Adams issued regulations which required that all transit buses bought with federal funds after September 30, 1979 would have to conform to federal regulations — namely being equipped with wheelchair lift ramps, wider doors and lower steps.

The regulations call for existing bus systems to have within six years a level of accessible regular service generally equal to half of the peak-hour service and all of the off-peak service.



Irving A. Cure

## I. A. Cure Heads County Bus System

Irving A. Cure, an executive with the firm operating the county's bus system for the past year, has been named resident manager in charge.

He succeeds John C. Pippin who had managed the system since its inception in August, 1971, as an employe of Florida Transit Management, Inc., a subsidiary of National City Management Company of Houston, Texas.

Cure was selected assistant to Pippin in February of 1978 by National City Management President Stanley H. Gates, Jr. In addition to assisting with overall operations of the 60-bus fleet, Cure has been responsible for fiscal matters and coordination of grants with the Urban Mass Transportation Administration (UMTA) and the Florida Department of Transportation (DOT).

A resident of urban Lake Worth, Cure is an accountant. He previously worked in the administrative department of Florida Transit. Responsibilities a year ago were expanded under a new contract with the Palm Beach County Transportation Authority (County Commission.) The county, one of two areas in the nation, received a \$689,000 federal grant to conduct the pilot program for the handicapped and elderly.

Before joining Florida Transit, Cure was a financial management executive with a nationwide development company.

## How the Wheelchair Lift Works



Ramp is lowered and extended from bus and wheelchair is backed onto ramp.



Ramp is raised by bus driver.



Wheels of wheelchair are locked into place inside of bus.



**NEW BUSES —** Forty Citycruiser buses are scheduled to be delivered in Palm Beach County by early 1980. The buses, which cost \$3.1 million, are equipped with wheelchair lifts and wide entrances to provide full accessibility to the handicapped.

Palm Beach County Transportation Authority  
P. O. Box 1989  
West Palm Beach, Florida 33402

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FLORIDA



# CoTran Newsletter

Produced for the  
Palm Beach County Transportation Authority

VOL. I, No. 2

SPRING-SUMMER, 1981

## CoTran Elderly, Handicapped Program Provides More Than 150 Wheelchair Lift Services A Month

CoTran, The Palm Beach County bus system, now is providing more than 150 wheelchair lift services per month.

Under an Elderly and Handicapped Demonstration Grant from the federal government, CoTran became the first public transit system in the nation to provide accessibility for the physically disadvantaged. The program was initiated in May 1980 and started modestly with 18 lift operations that month.

The largest number of users was 161 earlier this year.

Irving Cure, resident manager of CoTran, said ridership by the elderly and handicapped is expected to increase as various health and social service agencies continue to cooperate in an informational project.

Route 1, the main service in the central section of the county, served 65 passengers with wheelchair lifts during November to lead the 14 operating routes.

All regular route coaches are fitted with wheelchair lifts and special equipment such as lock-in devices for safe seating. A total of 63 buses provide the service for the elderly and handicapped. Larger coaches have two seats and smaller buses one seat to accommodate the disadvantaged.

Made possible by a \$689,000 grant through the Urban Mass Transportation Administration (UMTA), the program includes various surveys, monitoring and marketing efforts.

Cure said a special survey now is underway by a contracted interviewing firm to gain information for the federal government which has mandated lifts on all public transit systems within the next 10 years under existing law.

Interviewers will query current elderly and handicapped users of CoTran, non-users and the general public.



Handicapped rider is assisted off ramp by CoTran bus driver

(Continued on Page 3)

— CoTran —  
**Palm Beach County  
 Transportation Authority**

Palm Beach County Commissioners serve as the County Transportation Authority with jurisdiction over airports and the bus system, known as CoTran.

The current commission, which was instrumental in improving the public transit operations, beginning in 1978, include:

Frank Foster, Chairman, District 2.  
 Norman Gregory, Vice Chairman, District 4.  
 Mrs. Peggy Evatt, District 1.  
 Dennis Koehler, District 3.  
 Bill Bailey, District 5.

**Key Personnel**

John Sansbury, County Administrator.  
 Bruce V. Pelly, Transportation Coordinator.  
 Irving Cure, Resident Manager.

Published for the  
**Palm Beach County  
 Transportation Authority**  
 By Fred A. Fetterly  
 & Associates  
 Public Relations - Advertising

1650 Southern Boulevard  
 West Palm Beach, Florida  
 33406

## Bus Shelters Set At 20 Locations

A half dozen bus shelters now serve CoTran bus patrons and 14 more are on hand for erection, pending approval by county, municipal and Department of Transportation officials.

The covered shelters especially serve the elderly and handicapped.

Fifty additional shelters are expected as part of a federal grant which is expected to be approved within a few months.

Informational signs also are a part of CoTran's continuing improvement program. A total of 500 are anticipated and will be placed at bus stops throughout the county.

The laminated and enclosed informational signs will be attached to bus stop poles for the convenience of riders.

## How Wheelchair Lift Works



Ramp is lowered and extended from bus and wheel chair is backed onto ramp.



Ramp is raised by bus driver.



Wheels of wheelchair are locked into place inside of bus.

## Shopper Hopper Service Begins

Special Saturday services to major coastal malls will be initiated July 11 by CoTran, the county bus system.

Trips will originate in Boca Raton and the Twin City Mall in North Palm Beach, during daytime shopping hours.

The "shopper hopper" route, via Interstate 95 express buses, will include stops at the Twin City Mall, Palm Beach Mall, Town Center Mall in Boca Raton and the Boca Raton Mall.

Effective June 28, by a vote of the County Commission as the Transportation Authority, the bus fares increased to 60 cents as the basic adult fare and 30 cents for eligible elderly and handicapped with identification cards.

## I. D. Centers Provide Services

Identification centers, staffed by Florida Transit Management, Inc., employes, provide monthly services for the elderly and handicapped.

Persons 60 years of age and over and the handicapped may obtain permanent identification cards which allow them to ride CoTran buses for half fare, one way, anywhere in Palm Beach County. More than 55,000 persons now use the ID cards.

A one time charge of one dollar is assessed to help defray costs of photography and lamination.

Monthly announcements are made to inform the public of available ID centers.

Shopping centers, governmental and social agencies cooperate with CoTran to provide space.

Further information may be obtained by calling CoTran, 686-4555, in West Palm Beach.

# CoTran Pilot Program for Disabled One Year Old

CoTran's pilot program for wheelchair and other physically disabled clients became accessible in May 1980.

The federally-funded project, through the Urban Mass Transportation Administration (UMTA), can be traced to developments which began in the early 1960's.

Congress moved to support the disabled and elderly in 1973 when it passed the Urban Mass Transportation Act of 1964, as amended.

In essence, the Act stated:

"It is hereby declared to be the national policy that elderly and handicapped persons have the same right as other persons to utilize (public) mass transportation facilities and services...."

The Rehabilitation Act of 1973 strengthened the legislation.

In 1976 the Department of Health, Education and Welfare (HEW) was ordered to coordinate the implementation of the Rehabilitation Act. All federal agencies were directed to issue regulations on the subject.

In 1977, then Transportation Secretary Brock Adams issued rules which required that all mass transit buses purchased with federal funds after September 1979 would have to conform with the federal regulations, primarily by being equipped with wheelchair lift ramps, wider doors and lower steps.

## Three Million Ride Buses

Over three million passengers were accommodated on CoTran buses for the 1980 fiscal year ending Oct. 1.

The figure was 3,085,000 in comparison with only 923,512 in 1973, the first full year of operation with accountability.

CoTran Manager Irving Cure, in a report to the Metropolitan Planning Organization, projects an estimated 4,000,000 passengers this fiscal year (through Sept. 30) and almost six million during 1985.

## Marketing Program To Continue

A comprehensive marketing and promotional program is continuing in conjunction with the UMTA pilot project for accessibility to the handicapped and elderly on CoTran, the Palm Beach County bus system.

Fred A. Fetterly and Associates of West Palm Beach, a public relations and advertising firm in the county for more than 16 years, is in charge of marketing and promotion.

Fetterly, president of the firm, said the program, in cooperation with other agencies retained by UMTA, is designed to make every handicapped and elderly person in Palm Beach County aware of the accessible fixed route bus system.

All coaches in the countywide public mass transit operation are equipped with wheelchair lifts to aid the elderly and handicapped.

## CoTran Provides More Than 120 Wheelchair Lift Services A Month

*(Continued from Page 1)*

The survey will be conducted over the next few months since the UMTA demonstration grant terminates July 31. Multi-Systems Inc., based in Cambridge, Mass., holds a federal contract to evaluate results of the survey.

Robert Casey, an executive with the federal Department of Transportation, recently noted that the Palm Beach County public transit system under jurisdiction of the County Commission is the first in the United States to become accessible to the elderly and handicapped on all of its fixed routes. UMTA also awarded a demonstration grant for a similar project in the Champaign-Urbana area in Illinois.

While the grant ends July 31, Cure said CoTran will continue to serve the elderly and handicapped and provide information and accept suggestions for improvements.

He noted there is a sub-committee (E & H) of the county's Tran-

## Glades May get Four New Buses

Glades bus patrons could gain four new buses to improve CoTran operations and service under a federal grant being sought by the County Commission.

Residents of the Glades, including Belle Glade, Pahokee, Canal Point, South Bay and Lake Harbor, spoke favorably for a \$1,176,552 grant application at an informational meeting March 2 in Belle Glade, and a public hearing held March 17 by the County Commission.

Approximately \$800,000 in federal funds is expected to be approved by the federal government. Federal money would be matched with \$338,794 from Palm Beach County and \$57,770 from the Florida Department of Transportation. The total amount would cover bus purchases and operating assistance for two fiscal years.

transportation Advisory Board which deals with the subject and makes recommendations to the full board. In turn, the advisory body forwards its recommendations to the County Commission for final decisions.

Public transportation started less than modestly in the county in August 1971 when a privately owned bus system, operating primarily in the West Palm Beach area, went out of business. County Commissioners in office at that time purchased 20 used buses for a countywide system and hired Florida Transit Management, Inc., to operate it.

Commissioners, advised by Florida Transit, have made vast improvements during the past several years and initiated the revitalized system known as CoTran in May, 1980.

The existing fleet consists of 72 buses, including 40 smaller coaches purchased last year, 10 models five years old, nine 1974 models, five 1976 models, four 1971 models and four built in 1960.

# Rates And Service Changed On CoTran Routes

In order to shave \$1 million from the cost of operating CoTran, Palm Beach County Commissioners have approved fare increases and have reduced service on some CoTran routes.

The action came June 9, 1981 after CoTran manager Irving Cure announced that the federal government is moving to eliminate operating assistance to mass transit systems throughout the country.

Among the changes which were effective June 28, 1981, basic adult fares were increased from 50 cents one way to 60 cents; reduced fares for the elderly and handicapped went from 25 cents to 30 cents; children's fares for the 3 to 11 age group went from 25 cents to 30 cents, fares for students with identification cards were increased from 25 cents to 30 cents.

Children under three years old still will be able to ride free when accompanied by an adult. The adult monthly commuter pass increased from \$18 to \$22 and reduced (elderly and handicapped) passes went from \$9 to \$11 a month.

Under the commission action, the fare structure beginning in January 1982 will go to 75 cents one way for adults, 35 cents for the reduced fare, 35 cents for children 3 to 11 years of age, 35 cents for students and remain free for youngsters under three years old. Adult commuter pass fares will be boosted to \$27 a month, with reduced fares for the elderly and handicapped reaching \$13.50 monthly. Charter costs also will be increased.

Effective June 28, changes in the system's service included the following:

Elimination of Route 1 North from Twin City Mall to Palm Beach Mall.

All fixed routes on Sundays, Memorial Day, Labor Day, July 4, Thanksgiving, Christmas and New Year's Day have been eliminated.

Route 1 South from Palm Beach Mall to Boca Raton was cut.

Service was cut to two days a week in Tequesta, Jupiter, Boynton Beach, Boca Raton and city shuttle routes and operated only during base daytime periods. Palm Beach Gardens was placed on four-day a week service.

CoTran manager Irving Cure said details of the changes can be obtained at CoTran headquarters located at Palm Beach International Airport, Building S-1440, opposite Florida Mango Road off of Belvedere Road. Route schedules also are available at county governmental offices and from bus drivers.

The bus system is currently losing \$3.7 million per year. However, the federal government has reduced this deficit by funneling about \$1.7 million into CoTran. Without the current changes, the present deficit of about \$3.7 million would have increased to nearly \$8 million in five years.

## CoTran Routes

CoTran bus routes operate in all sections of Palm Beach County, from Boca Raton to the Jupiter-Tequesta area and into the Glades.

The system includes:

Route 1 — South County — Lantana, Hypoluxo, Boynton Beach, Delray Beach, Boca Raton via US 1 and Seacrest Boulevard.

Route 1 — Central County — Riviera Beach, Twin City Mall, Lake Park, West Palm Beach, Lake Worth and Lantana, via US 1.

Route 1N, 1T, 1J, 1P serving north county areas of Tequesta, Jupiter and Palm Beach Gardens.

Route 2 — West Palm Beach via suburban Lake Worth.

Route 3 — Lake Worth, West Palm Beach, Riviera Beach and Singer

Island.

Route 4 — Crosstown West Palm Beach to Palm Beach.

Route 4S — Crosstown West Palm Beach.

Route 5 — West Palm Beach, via Tamarind Avenue to Palm Beach Inlet.

Route 6 — Crosstown Lake Worth.

Route 7 — Delray Beach, north, south and crosstown.

Route 8 — Crosstown Boca Raton.

Route 9 — Crosstown Boynton Beach.

Route 10 — West Palm Beach to Belle Glade.

Route 11 — Glades area, Belle Glade, South Bay, Pahokee.

Route 12 — City of Boca Raton.

Route 20 — Suburban Lake Worth to Palm Beach Mall via Military Trail.

Palm Beach County Transportation Authority  
P. O. Box 1989  
West Palm Beach, Florida 33402

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Appendix C  
EQUIPMENT SPECIFICATIONS



SPECIFICATIONS

HANDICAP LIFT DEVICE KIT

FOR

RETRO-FITTING

VEHICLE MODELS

GMC TDH5106, TDH4517, & TDH4523

PURCHASER

PALM BEACH COUNTY

TRANSPORTATION

AUTHORITY

GENERAL

The lift device shall be so designed that in its' stowed position it will form the normal entrance steps of the transit vehicle, thereby avoiding the necessity of using it to accommodate ALL patrons boarding or alighting at the front entrance.

Each kit shall contain all interior panels, structural parts, electrical, hardware, and other parts required to facilitate the Vehicle Models for lift installation and for completing the finish work to produce operational lift equipped buses.

TYPE

Integral part of standard or modified front door opening, steel frame.

OPERATION

Mechanical/Hydraulic over hydraulics:

Engine driven with auxiliary hand pump standard equipment.

PLATFORM

DIMENSIONS:

Width - 35", Length - 36" with 16", 8 degree ramp angle for total 52".

CYCLE TIME:

30 seconds minimum - 45 seconds maximum.

CYLINDERS:

Maximum 5 - two (2) main lift and three (3) step operation mode cylinders for a total lift capacity of all - 3,000 lbs. designed to withstand 3000 P.S.I. operating pressures.

PUMP:

Five (5) gallons per minute with 600 pounds normal operating line pressure and 2000 P.S.I. capability with an adjustable

relief setting.

TEST RESULTS:

1,000 cycles with 940 lbs.

5,000 cycles from step to platform.

6,000 cycles floor to ground with 300 lbs. weight on platform.

SAFETY FEATURES

HAND PUMP:

To enable the driver or attendant to operate the unit in the event of failure.

PLATFORM:

Automatic shut-down feature if lift touches a person or object when operating in the lowering position. Safety stop to prevent wheelchair roll off. Platform shall NOT be able to be reacted into step configuration when occupied.

LIFT:

Hydraulically operated, electrically controlled, and shall consist of heavy metal structure with minimum lifting capacity of 950 lbs. Can NOT be extended when entrance door is closed.

BRAKES:

Bus movement is prevented when lift is in any position other than fully stowed.

ENTRANCE DOOR:

Cannot be closed until lift is in fully stowed position.

Platform, ramp, and steps to be covered with non-skid material similiar to front entrance platform.

Standard type steps when lift is not in operation. When operated no open access to under structure of vehicle.

All interior panels shall be free of sharp edges and/or corners which could cause injury to operator or patron. There shall be two (2) control locations for the electrical equipment making system operational.

1. Control console mounted convenient to the driver so device can be operated from the driver's seat.
2. One console mounted in the front entrance door convenient to attendant or patron.
3. All controls shall be clearly marked for identification and function.
4. The control solenoids shall be constructed so as to provide manual operation in event of electrical failure and design must be approved by the Palm Beach County Transportation Authority.
5. Emergency back up system. Minimum clear entry thru the front doors to be 34 inches.
6. Lift assembly to be bolted in position, no welding is acceptable.
7. All safety flaps to be powered, no gravity flaps acceptable.
8. Cycle times to be adjustable by a mechanic - operation between 20 seconds and 45 seconds. Must have test results of not less than 1000 cycles under test load 900 lbs. minimum.
9. No moving parts to be exposed. All functions to be automatically stopped.  
i.e. Sensitive edges stop all movement automatically upon contact - outward and downward.

SERVICE MANUAL  
ELECTRO-HYDRAULIC LIFT  
FOR THE HANDICAPPED  
U.S. PATENT No. 4027807  
Other U.S. & Foreign Patents Pending

Model Numbers  
G-30

TRANSPORTATION DESIGN AND TECHNOLOGY, INC.

9345 CABOT DRIVE

SAN DIEGO, CA 92126

(714) 566-8940

## DESCRIPTION

### A. GENERAL

The hydraulically operated and electrically controlled lift system is intended for use by the handicapped. Design of the lift has taken into consideration both the physical and psychological needs of the handicapped. Special provisions are made for safety and efficient handling of a wheelchair, however, the lift can also be used for handicapped and elderly persons not confined to a wheelchair.

Design of the lift is adaptable to most urban and interurban transit coaches and can be retrofitted without major modifications. Lift controls can be conveniently located to meet the requirements of individual owners/operators.

Lift operation will cause minimal delay in normal vehicle operation. The unit can be deployed, ready for wheelchair boarding, raised to vehicle floor level, and returned to step configuration in approximately 30 seconds.

The lift system is an electro-mechanical arrangement which operates on 12 volts dc. The hydraulic system may be completely self-contained without external connections, or use an engine-driven hydraulic pump. Figures 1 and 2 depict the lift in stowed and deployed positions.

### B. STRUCTURE

The lift frame is constructed of welded steel tubing. The platform and lower closure are also steel. The lift platform is formed by a double hinged assembly which forms the vehicle entrance/exit step, in the stowed position. In the deployed position, the step and riser form a portion of the lift platform as shown in Figure 2. Outward and inward telescoping ramp movement is conducted in a steel slide track assembly equipped with channel mounted roller bearings.

The ramp platform surface is equipped with a replaceable bonded non-skid surface.

### C. HYDRAULIC AND ELECTRICAL EQUIPMENT

Lift hydraulic pressure is supplied from either an internal electrically driven pump and reservoir unit or vehicle engine driven pump. The system maximum pressure is factory set at 1,250 psi. Normal operating pressure is 800 psi.

Electrical controls, by selection, operate valves to control ramp in and out, and up and down movements. These controls direct fluid to flow actuators.

A set of vertically mounted cylinders raise, lower and partially extend the vehicle entrance step which forms the lift floor when deployed. Another set of vertically mounted cylinders lower the lift platform assembly from step height to curb or ground level and raise the platform to vehicle floor height.

A check valve in the system prevents inadvertent lowering of the lift platform when system hydraulic solenoid valves are not engaged. A ramp tapeswitch will shut off ramp operation when tripped.

Cylinder action (mounted under lift floor) extends the ramp to a fully deployed position. Two small cylinders, under the ramp deploy a wheelchair safety lock. This is accomplished by electrically opening a normally closed solenoid valve. A flow divider divides the hydraulic fluid flow returning from lifting cylinders, to prevent the lift from binding, regardless of platform load distribution. There are also two flow control valves on both of the lifting cylinders, these enable the platform to be finely tuned to ensure a perfectly level platform.

#### D. SAFETY INTERLOCK FEATURES

The leading edge of the ramp is equipped with a tapeswitch which, when making contact with an object, stops all operation. The tapeswitch, when activated, can be overridden, if necessary, by a push-button operated electrical switch. The switch is located on the dash control panel.

An ON-OFF guarded switch is located on the dash control panel.

As a safety precaution, the lift, when in platform configuration, cannot be lowered or raised until the safety door guarded switch is activated and the wheelchair safety lock flap is in raised position. When the tapeswitch on the leading edge of the ramp is depressed by the platform contacting curb or ground, it stops lift operation, preventing the lift from attempting to lift the vehicle.

#### E. MANUAL OPERATING EQUIPMENT

In the event that the ramp cannot be operated electrically, a hand pump can be provided to perform hydraulic operation.

SPECIFICATIONS

FOR

Purchase of

Sixty-Six (66)

TRANSVERSE-Elderly & Handicap

2 Passenger Flip-Up Seat

With Wheel Chair Accommodation

Passenger Seats:

Elderly and handicapped seat shall be American Seating Company, Model 6426 Wheel Chair Accommodation seat or approved equal, and shall conform to the following specifications:

- (a) The general design of seat structure shall be engineered and based on requirements defined to obtain a structure of good quality with superior product and functional value, providing features for optimum comfort and safety in accommodating elderly and handicapped passengers.
- (b) The bidder shall include in his proposal the estimated weight of each assembly.
- (c) The seat shall be a maximum of 18 inches deep, maximum 34 inches wide, and top of back including grabrail a maximum of 37 inches from floor.
- (d) Heavy gauge stainless steel brackets shall be provided for attaching the seat frame to the wall mounting on both left and right hand assemblies.
- (e) Outer back panels to be anodized patterned aluminum.
- (f) The grabrail shall be padded and assembled as an integral part of the seat frame with top of cushion back not to extend above frame to assure-passenger comfort and safety.
- (g) The upholstering shall be heavy-duty transporta-

tion grade vinyl, with purchaser to select color.

(h) Stainless steel back tube and legs with balance of frame to be covered with oven-baked enamel.

(j) Provide seat belt and locks capable of securing patron in wheel chair.

(k) Polyurethane fillers to be used in seat and back cushions.

Strength Requirements and Testing:

Tests shall be conducted using various simulated conditions such as use of coach flooring with side seat mounting and other conditions expected in transit useage of seat.

Static load test as follows:

(1) 400 pounds per passenger vertical downward at center of seat bottom with permanent set not to exceed  $\frac{1}{4}$  inch.

(2) 300 pounds per passenger vertical downward on front edge at center of sitting, with permanent set not to exceed  $\frac{1}{4}$  inch.

(3) 300 pounds horizontal both fore and aft to the top edge of aisle back 4 inches from the side edge with permanent set not to exceed  $\frac{1}{2}$  inch at 200 pounds.

(4) Verticle drop impact to the seat with 40 pounds weight, from 6 inches, 8 inches, and 10 inches in height. 1,000 drops for each height.

(5) Swinging impact with 40 pounds weight to back from front and rear. Tests shall include impact through 6 inches, 8 inches, and 12 inches horizontal distances, 10,000 strokes for each distance. The pendulum length equals 36 inches.

Appendix D  
SURVEY OF DISABLED LIFT-USERS



COTRAN LIFT BUS USER SURVEY

Good Day!

This survey is being conducted by CoTran, the Palm Beach County Transportation Authority. As you may know, CoTran has specially equipped all of its transit buses with lifts at the front door so that wheelchair users and other passengers who have difficulty climbing stairs can use regular route lift bus service.

The results of this survey will be used to evaluate how successful the lift-equipped buses are in providing transportation to disabled residents of Palm Beach County.

Please help us improve transportation for everyone by taking time to complete this survey. Your cooperation is very much appreciated.

Percent (No. Respondents)

1. Would you be physically able to use regular CoTran (county transit) buses if they were not lift-equipped?

35% (7)     ( 1)    Yes

65% (13)     ( 2)    No

2. Have you ever used the lift on a CoTran bus?

95% (19)     ( 1)    Yes

5% (1)     ( 2)    No

If you answered NO to QUESTION 2, please stop here and request a NON-USER SURVEY.

A. INFORMATION ABOUT YOUR DISABILITY AND/OR HANDICAP

1. What are your disabilities? (please check all that apply):

10% (2)	<input type="checkbox"/>	( 1) Cerebral palsy	<input type="checkbox"/>	(12) Deafness/hearing impairment	0
5% (1)	<input type="checkbox"/>	( 2) Muscular dystrophy			
10% (2)	<input type="checkbox"/>	( 3) Multiple sclerosis	<input type="checkbox"/>	(13) Speech impairment	5% (1)
20% (4)	<input type="checkbox"/>	( 4) Arthritis	<input type="checkbox"/>	(14) Spina bifida	0
5% (1)	<input type="checkbox"/>	( 5) Epilepsy	<input type="checkbox"/>	(15) Orthopedic (bone or joint) impairment	30% (6)
0	<input type="checkbox"/>	( 6) Polio			
5% (1)	<input type="checkbox"/>	( 7) Mental retardation	<input type="checkbox"/>	(16) Paraplegic	15% (3)
15% (3)	<input type="checkbox"/>	( 8) Stroke	<input type="checkbox"/>	(17) Quadriplegic	5% (1)
5% (1)	<input type="checkbox"/>	( 9) Heart impairment	<input type="checkbox"/>	(18) Hemaplegic	0
5% (1)	<input type="checkbox"/>	(10) Lung impairment	<input type="checkbox"/>	(19) Amputee	0
10% (2)	<input type="checkbox"/>	(11) Blindness/visual impairment	<input type="checkbox"/>	(20) Temporary injury	5% (1)
			<input type="checkbox"/>	(21) Other _____ (specify)	15% (3)

2. Which of the following difficulties or handicaps do you experience when travelling? (Please check all that apply):

100% (20)	<input type="checkbox"/>	( 1) Difficulty climbing stairs
95% (19)	<input type="checkbox"/>	( 2) Difficulty walking
50% (10)	<input type="checkbox"/>	( 3) Difficulty maneuvering through crowds
35% (7)	<input type="checkbox"/>	( 4) Difficulty waiting outside for buses
65% (13)	<input type="checkbox"/>	( 5) Difficulty standing in moving vehicles
55% (11)	<input type="checkbox"/>	( 6) Difficulty maintaining balance while bus stops and starts
20% (4)	<input type="checkbox"/>	( 7) Unable to grasp/hold handrails on a bus
20% (4)	<input type="checkbox"/>	( 8) Unable to manipulate coins, tickets, etc.
20% (4)	<input type="checkbox"/>	( 9) Visual difficulty
15% (3)	<input type="checkbox"/>	(10) Communication difficulty
15% (3)	<input type="checkbox"/>	(11) Difficulty in understanding the bus system

3. Do curbs or other obstacles pose a barrier to your getting to the bus stop? Please indicate how much of a problem the following are by checking the appropriate box:

	( 1 ) <u>Serious</u> <u>problem</u>	( 2 ) <u>Slight</u> <u>problem</u>	( 3 ) <u>No</u> <u>problem</u>
a. curbs	55% (11) <input type="checkbox"/>	15% (3) <input type="checkbox"/>	30% (6) <input type="checkbox"/>
b. inclines	39% (7) <input type="checkbox"/>	28% (5) <input type="checkbox"/>	33% (6) <input type="checkbox"/>
c. rough street surface/ lack of sidewalks	35% (6) <input type="checkbox"/>	24% (4) <input type="checkbox"/>	41% (7) <input type="checkbox"/>
d. crossing major streets	58% (11) <input type="checkbox"/>	21% (4) <input type="checkbox"/>	21% (4) <input type="checkbox"/>
e. other _____ (specify)	50% (2) <input type="checkbox"/>	50% (2) <input type="checkbox"/>	0 <input type="checkbox"/>

4. What aids do you use when travelling outside of the house?

- 65% (13)  ( 1 ) Wheelchair
- 15% (3)  ( 2 ) Walker
- 15% (3)  ( 3 ) Walking Cane
- 5% (1)  ( 4 ) Crutches
- 10% (2)  ( 5 ) Braces
- 0  ( 6 ) Artificial limb
- 0  ( 7 ) Guide dog
- 0  ( 8 ) White cane
- 25% (5)  ( 9 ) Another person (escort)
- 0  (10) Special controls on my automobile
- 0  (11) My own lift-equipped van
- 5% (1)  (12) Other \_\_\_\_\_  
(specify)
- 5% (1)  (13) None

For Wheelchair Users (only):

5. Do you always use a wheelchair when outside of the house?

( 1) Yes 100% (12)

( 2) No 0

6. What type of wheelchair do you use?

( 1) Manual - narrow 8% (1)

( 2) Manual - standard 46% (6)

( 3) Manual - wide 0

( 4) Manual - junior 8% (1)

( 5) Power drive - conventional (E&J) 15% (2)

( 6) Power drive - Amigo 15% (2)

( 7) Power drive - Abec 0

( 8) Power drive - other 0

( 9) Both power and manual 8% (1)

Please Continue

B. TRANSPORTATION

1. Do you have a driver's license?

35% (7)  ( 1) Yes

65% (13)  ( 2) No

2. Do you (or does someone in your household) own a car or van?

40% (8)  ( 1) Yes, I have a car/van

20% (4)  ( 2) Other member of household has a car/van

40% (8)  ( 3) No

3. Other than CoTran bus service, what means of travel are frequently available to you? (Check all that apply)

25% (5)  ( 1) Drive

40% (8)  ( 2) Obtain a ride from a member of my household

40% (8)  ( 3) Obtain a ride from a friend

20% (4)  ( 4) Human (social) service agency transportation

20% (4)  ( 5) Taxi

15% (3)  ( 6) Private wheelchair-van service (Medicar)

10% (2)  ( 7) Other \_\_\_\_\_  
(specify)

15% (3)  ( 8) None

4. If each of the following were available, which would you be physically able to use? (Check all that apply)

37% (7)  ( 1) Drive

84% (16)  ( 2) Obtain a ride from a member of my household

84% (16)  ( 3) Obtain a ride from a friend

79% (15)  ( 4) Human (social) service agency transportation

58% (11)  ( 5) Taxi

63% (12)  ( 6) Private wheelchair-van service (Medicar)

58% (11)  ( 7) Door-to-door transit service (Dial-a-Ride)

16% (3)  ( 8) Other \_\_\_\_\_  
(specify)

0  ( 9) None

5. Please indicate HOW MANY one-way\* trips you made last week for each purpose by each of the following means:

\* Note that going somewhere is one trip. Returning is a second trip.

Purpose	Means								Means by Trip Purpose
	Walk/Wheel	Drive	Obtain a Ride From a Household Member	Human Service Agency Transportation	Taxi	CoTran Bus	Private Wheelchair Van Service (Medicar)	Other (specify below)	
a. Work	0	.5	.5	0	0	.5	0	0	1.5
b. School	0	.1	0	0	0	0	0	.5	.6
c. Shopping	1.2	.5	.2	.1	0	.9	0	0	3.0
d. Medical	.1	.3	.1	0	0	.7	.1	0	1.3
e. Religious	0	.1	0	.5	0	0	0	.1	.7
f. Meals	.8	0	0	0	0	.3	0	.5	1.6
g. Social/ Recreational	2.1	.2	0	0	0	2.2	0	0	4.5
h. Personal Business/Other	.5	.2	0	0	0	.6	.1	0	1.4

Grand Mean=14.5

If you made no CoTran lift-bus trips last week, skip to Question 8, page 7.

6. How would you have made last week's lift bus trips if there were no lift bus service?

(Check all the means of travel you would have been likely to use.)

- 13% (1)  ( 1) Bus  
0  ( 2) Drove  
13% (1)  ( 3) Got a ride from a member of my household  
50% (4)  ( 4) Got a ride from a friend  
0  ( 5) Human (social) service agency  
0  ( 6) Taxi  
0  ( 7) Private wheelchair-van service (Medicar)  
0  ( 8) Didn't need to make trip  
50% (4)  ( 9) Unable to make trip

7. How many of your lift bus trips last week involved transfers to other CoTran buses? Avg.=4.6

- 8a. How far is the nearest bus stop from your home?

- 44% (8)  ( 1) Less than 1 block  
6% (1)  ( 2) 1 block  
6% (1)  ( 3) 2 blocks  
11% (2)  ( 4) 3 blocks  
22% (4)  ( 5) 4 or more blocks  
11% (2)  ( 6) Not sure

- b. What is the route number which serves this bus stop? (If you don't know, place zeros in spaces provided.)

Don't Know  
20% (3) Route \_\_\_\_\_ Route \_\_\_\_\_

- c. How often are the buses scheduled to operate on this route during commuting hours?

- 24% (4)  ( 1) More than one hour apart  
18% (3)  ( 2) Every hour  
18% (3)  ( 3) Every half-hour  
6% (1)  ( 4) Every 20 minutes  
0  ( 5) Every 10 minutes or less  
35% (6)  ( 6) Not sure

9. How far would you be willing to walk/wheel to a bus stop:

a. In good weather?

- 25% (5)  ( 1) Less than 1 block  
15% (3)  ( 2) 1 block  
5% (1)  ( 3) 2 blocks  
10% (2)  ( 4) 3 blocks  
45% (9)  ( 5) 4 or more blocks

b. In rainy weather?

- 0  ( 1) Less than 1 block  
5% (1)  ( 2) 1 block  
5% (1)  ( 3) 2 blocks  
0  ( 4) 3 blocks  
15% (3)  ( 5) 4 or more blocks  
75% (15)  ( 6) Would not travel

10. Do you need personal assistance from an escort:

a. To get to the bus stop?

- 30% (6)  ( 1) Yes \_\_\_\_\_  
(explain)  
70% (14)  ( 2) No

b. To travel on the lift bus?

- 30% (6)  ( 1) Yes \_\_\_\_\_  
(explain)  
70% (14)  ( 2) No

c. To travel by taxi?

- 55% (11)  ( 1) Yes \_\_\_\_\_  
(explain)  
30% (6)  ( 2) No  
15% (3)  ( 3) Not sure

d. To travel by human (social) service agency or private wheelchair-van transportation (Medicar)?

- 45% (9)  ( 1) Yes \_\_\_\_\_  
(explain)  
50% (10)  ( 2) No  
5% (1)  ( 3) Not sure

11. How did you first learn about CoTran's lift-equipped buses? (Please check all that apply)

- 0  ( 1) Radio
- 37% (7)  ( 2) TV
- 52% (10)  ( 3) Newspaper/magazine
- 5% (1)  ( 4) Saw CoTran demonstrating the operation of the lift
- 0  ( 5) Human (social) service agency
- 21% (4)  ( 6) Word of mouth
- 5% (1)  ( 7) Saw someone using the lift in service
- 5% (1)  ( 8) Health care worker/therapist/counselor
- 0  ( 9) Realized bus you were about to board had lift mechanism
- 0  (10) Other \_\_\_\_\_  
(specify)

12. What most influenced you to try the lift?  
(Check only one answer)

- 0  ( 1) Radio
- 15% (3)  ( 2) TV
- 15% (3)  ( 3) Newspaper/magazine
- 0  ( 4) Saw CoTran demonstrating the operation of the lift
- 0  ( 5) Human (social) service agency
- 10% (2)  ( 6) Saw someone using the lift in service
- 20% (4)  ( 7) Friend recommended it
- 0  ( 8) Escort volunteered to go with me
- 10% (2)  ( 9) Health care worker/therapist/counselor
- 30% (6)  (10) Other \_\_\_\_\_  
(specify)



C. CURRENT LIFT USERS

1a. Within the past 3 months, have you ever tried to get on a lift bus but been unable to?

38% (6)  ( 1) Yes 63%(10)  ( 2) No 0  ( 3) Don't remember

b. IF YES, Do you know why you were unable to board the bus? (RECORD THE NUMBER OF TIMES EACH OCCURRED IN THE SPACE PROVIDED)

- \_\_\_\_\_ ( 1) Lift was inoperative  
\_\_\_\_\_ ( 2) Driver refused to stop or allow me to board for unknown reason  
\_\_\_\_\_ ( 3) Cars parked in bus stop or other barriers prevented me from reaching the bus  
\_\_\_\_\_ ( 4) Bus was too crowded  
\_\_\_\_\_ ( 5) Unable to maneuver chair onto lift  
\_\_\_\_\_ ( 6) Wheelchair positions already occupied  
\_\_\_\_\_ ( 7) Other \_\_\_\_\_  
(specify)  
\_\_\_\_\_ ( 8) Don't know

No Answer  
100%

c. After you were unable to get on the bus, what did you usually do?

- 33% (2)  ( 1) Not make the trip  
0  ( 2) Got a ride  
0  ( 3) Took a taxi  
50% (3)  ( 4) Waited for another bus  
17% (1)  ( 5) Other \_\_\_\_\_  
(specify)

2. Has the lift bus service increased the total number of trips you make?

- 69% (11)  ( 1) Yes  
31% (5)  ( 2) No

3. Has the lift bus service enabled you to travel to new places and to new activities?

- 50% (8)  ( 1) Very much so  
19% (3)  ( 2) Somewhat  
31% (5)  ( 3) Not at all -- (Skip to Question 5, page 12)

4. What are those places and activities? (Check all that apply)

- 22% (2)  ( 1) Get a job or change jobs  
0  ( 2) Apply for different jobs  
44% (4)  ( 3) Be more independent of others  
0  ( 4) Attend school or training  
0  ( 5) Attend religious service  
44% (4)  ( 6) Attend social events  
67% (6)  ( 7) Entertainment/Recreation  
33% (3)  ( 8) See more of family/friends  
33% (3)  ( 9) Visit medical/health facilities  
56% (5)  (10) Go shopping  
11% (1)  (11) Utilize social services, such as day care, nutrition, etc.  
0  (12) Other \_\_\_\_\_  
(specify)

5. Despite the availability of lift bus service, are you still unable to travel for any of the following types of trips?

a. Work/school trips?

- 8% (1)  ( 1) Often  
0  ( 2) Sometimes  
92% (12)  ( 3) Never  
0  ( 4) Not sure

b. Shopping trips?

- 14% (2)  ( 1) Often  
29% (4)  ( 2) Sometimes  
57% (8)  ( 3) Never  
0  ( 4) Not sure

c. Medical trips?

- 7% (1)  ( 1) Often  
43% (6)  ( 2) Sometimes  
50% (7)  ( 3) Never  
0  ( 4) Not sure

d. Other trips?

- 7% (1)  ( 1) Often  
50% (7)  ( 2) Sometimes  
43% (6)  ( 3) Never  
0  ( 4) Not sure



d. What was the cost of the trip (one-way) then?

- |     |                          |                          |                          |                          |                          |
|-----|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 0   | <input type="checkbox"/> | ( 1) 15¢ or under        | <input type="checkbox"/> | ( 7) \$2.01 - \$3.00     | 0                        |
| 29% | (2)                      | <input type="checkbox"/> | ( 2) 16¢ - 25¢           | <input type="checkbox"/> | ( 8) Over \$3.00 0       |
| 29% | (2)                      | <input type="checkbox"/> | ( 3) 26¢ - 50¢           | <input type="checkbox"/> | ( 9) Free 14% (1)        |
| 0   | <input type="checkbox"/> | ( 4) 51¢ - 75¢           | <input type="checkbox"/> | (10) Not applicable      | 14% (1)                  |
| 14% | (1)                      | <input type="checkbox"/> | ( 5) 76¢ - \$1.00        | <input type="checkbox"/> | (11) Contribution only 0 |
| 0   | <input type="checkbox"/> | ( 6) \$1.01 - \$2.00     |                          |                          |                          |

e. How long did the trip generally take (door to door)?

- |     |                          |                          |                          |                          |                        |
|-----|--------------------------|--------------------------|--------------------------|--------------------------|------------------------|
| 14% | (1)                      | <input type="checkbox"/> | ( 1) 5 minutes           | <input type="checkbox"/> | ( 6) 1 hour 0          |
| 0   | <input type="checkbox"/> | ( 2) 10 minutes          | <input type="checkbox"/> | ( 7) 1-1/4 hour 0        |                        |
| 0   | <input type="checkbox"/> | ( 3) 15 minutes          | <input type="checkbox"/> | ( 8) 1-1/2 hour 0        |                        |
| 57% | (4)                      | <input type="checkbox"/> | ( 4) 30 minutes          | <input type="checkbox"/> | ( 9) 1-3/4 hour 0      |
| 29% | (2)                      | <input type="checkbox"/> | ( 5) 45 minutes          | <input type="checkbox"/> | (10) 2 hours or more 0 |

8. How do you usually get from your home to the bus stop where you catch the lift bus?

- |      |                          |  |                 |           |  |
|------|--------------------------|--|-----------------|-----------|--|
| 100% | (20)                     | <input type="checkbox"/>                       | ( 1) Walk/wheel |           |  |
| 0    | <input type="checkbox"/> | ( 2) Drive automobile                          |                 |           |  |
| 0    | <input type="checkbox"/> | ( 3) Obtain ride from a member of my household |                 |           |  |
| 0    | <input type="checkbox"/> | ( 4) Obtain ride from a friend                 |                 |           |  |
| 0    | <input type="checkbox"/> | ( 5) Other _____                               |                 |           |  |
|      |                          |  |                 | (specify) |  |

9. How long does it take you to get to this bus stop?

- |     |                          |                          |                 |                          |                                  |
|-----|--------------------------|--------------------------|-----------------|--------------------------|----------------------------------|
| 36% | (5)                      | <input type="checkbox"/> | ( 1) 5 minutes  | <input type="checkbox"/> | ( 5) 25 minutes 0                |
| 36% | (5)                      | <input type="checkbox"/> | ( 2) 10 minutes | <input type="checkbox"/> | ( 6) 30 minutes 0                |
| 21% | (3)                      | <input type="checkbox"/> | ( 3) 15 minutes | <input type="checkbox"/> | ( 7) more than 30 minutes 7% (1) |
| 0   | <input type="checkbox"/> | ( 4) 20 minutes          |                 |                          |                                  |

Please Continue

D. REACTIONS TOWARD LIFT BUSES (All users)

1. Listed below are a number of problems you may have had when using the CoTran lift bus. Please indicate the degree of difficulty you experienced by checking the appropriate box for each problem.

	(1) <u>Serious Problem</u>	(2) <u>Slight Problem</u>	(3) <u>No Problem</u>
a. Lack of convenient bus stops/routes	<input type="checkbox"/> 20% (4)	<input type="checkbox"/> 15% (3)	<input type="checkbox"/> 65% (13)
b. Difficulty getting schedules	<input type="checkbox"/> 20% (4)	<input type="checkbox"/> 25% (5)	<input type="checkbox"/> 55% (11)
c. Feeling safe getting to the bus stop	<input type="checkbox"/> 20% (4)	<input type="checkbox"/> 10% (2)	<input type="checkbox"/> 70% (14)
d. Getting to the bus in bad weather	<input type="checkbox"/> 60% (12)	<input type="checkbox"/> 25% (5)	<input type="checkbox"/> 15% (3)
e. Lack of bus shelters	<input type="checkbox"/> 45% (9)	<input type="checkbox"/> 10% (2)	<input type="checkbox"/> 45% (9)
f. Lack of wheelchair ramps at curbs	<input type="checkbox"/> 50% (10)	<input type="checkbox"/> 10% (2)	<input type="checkbox"/> 40% (8)
g. Buses not arriving on time	<input type="checkbox"/> 26% (5)	<input type="checkbox"/> 21% (4)	<input type="checkbox"/> 53% (10)
h. Buses not stopping at curb or accessible location	<input type="checkbox"/> 21% (4)	<input type="checkbox"/> 21% (4)	<input type="checkbox"/> 58% (11)
i. Entry denied because lift inoperable	<input type="checkbox"/> 40% (8)	<input type="checkbox"/> 10% (2)	<input type="checkbox"/> 50% (10)
j. Getting onto the lift platform	<input type="checkbox"/> 6% (1)	<input type="checkbox"/> 22% (4)	<input type="checkbox"/> 72% (13)
k. Lift platform is too short	<input type="checkbox"/> 6% (1)	<input type="checkbox"/> 11% (2)	<input type="checkbox"/> 83% (15)
l. Feeling secure on the lift	<input type="checkbox"/> 11% (2)	<input type="checkbox"/> 5% (1)	<input type="checkbox"/> 84% (16)
m. Drivers not helpful	<input type="checkbox"/> 25% (5)	<input type="checkbox"/> 15% (3)	<input type="checkbox"/> 60% (12)
n. Using the farebox	<input type="checkbox"/> 11% (2)	<input type="checkbox"/> 11% (2)	<input type="checkbox"/> 79% (15)
o. Priority seating for handicapped/elderly not available	<input type="checkbox"/> 5% (1)	<input type="checkbox"/> 5% (1)	<input type="checkbox"/> 90% (17)

		(1) Serious Problem	(2) Slight Problem	(3) No Problem
p.	Maneuvering to the wheelchair position	<input type="checkbox"/> 0	<input type="checkbox"/> 16% (3)	<input type="checkbox"/> 84% (16)
q.	Crowds in the aisle	<input type="checkbox"/> 11% (2)	<input type="checkbox"/> 22% (4)	<input type="checkbox"/> 67% (12)
r.	Bus driver moves the bus too soon, lose balance	<input type="checkbox"/> 11% (2)	<input type="checkbox"/> 26% (5)	<input type="checkbox"/> 63% (12)
s.	Non-wheelchair passenger seated in wheelchair location	<input type="checkbox"/> 0	<input type="checkbox"/> 22% (4)	<input type="checkbox"/> 78% (14)
t.	Wheelchair location already occupied	<input type="checkbox"/> 6% (1)	<input type="checkbox"/> 6% (1)	<input type="checkbox"/> 89% (16)
u.	Lifting the special seat	<input type="checkbox"/> 0	<input type="checkbox"/> 0	<input type="checkbox"/> 100% (17)
v.	Fastening seat belt	<input type="checkbox"/> 20% (4)	<input type="checkbox"/> 15% (3)	<input type="checkbox"/> 68% (13)
w.	Securing the special wheelchair locking device	<input type="checkbox"/> 26% (5)	<input type="checkbox"/> 5% (1)	<input type="checkbox"/> 68% (13)
x.	Releasing the special wheelchair locking device	<input type="checkbox"/> 17% (3)	<input type="checkbox"/> 0	<input type="checkbox"/> 83% (15)
y.	Once in position, fear of wheelchair rolling while bus is in motion	<input type="checkbox"/> 6% (1)	<input type="checkbox"/> 11% (2)	<input type="checkbox"/> 83% (15)
z.	Letting the driver know when you want to get off	<input type="checkbox"/> 6% (1)	<input type="checkbox"/> 0	<input type="checkbox"/> 94% (17)
aa.	Bus ride is uncomfortable	<input type="checkbox"/> 0	<input type="checkbox"/> 12% (2)	<input type="checkbox"/> 88% (15)
bb.	Attitude of other passengers	<input type="checkbox"/> 6% (1)	<input type="checkbox"/> 12% (2)	<input type="checkbox"/> 82% (14)



No Answer  
100%

5. If No, check major reason(s) why not? (No more than 3 reasons please)

- ( 1) Bus does not go where I need to go
- ( 2) Schedule is not convenient
- ( 3) Bus system is too confusing
- ( 4) Bus stop is too far
- ( 5) Concerned about personal security in the streets
- ( 6) Too many physical barriers in the street
- ( 7) Dealing with traffic is too dangerous
- ( 8) Cannot wait for a bus at the bus stop
- ( 9) Service was not reliable
- (10) Had difficulty using the lift
- (11) Driver was not helpful enough
- (12) Did not feel secure on the lift
- (13) Had difficulty maneuvering on the vehicle
- (14) Buses are too crowded
- (15) Bus ride is uncomfortable
- (16) Transferring to another bus takes too long
- (17) Transferring to another bus is too difficult for me
- (18) Embarrassed
- (19) Have since obtained an automobile/specially equipped van
- (20) Prefer to use other travel means
- (21) Am no longer transportation handicapped (or in wheelchair)
- (22) Am no longer physically able to travel
- (23) Need personal assistance to travel by bus
- (24) Cannot afford the bus fare
- (25) Other \_\_\_\_\_  
(specify)

6. Would you prefer a door-to-door service?

47% (9)  ( 1) Yes

47% (9)  ( 2) No, \_\_\_\_\_  
(explain)

5% (1)  ( 3) Not sure, \_\_\_\_\_  
(explain)

7. What improvements do you consider are most necessary to enhance the lift-equipped service?

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Please Continue

F. GENERAL CHARACTERISTICS

(This information is for statistical purposes only.)

1. Do you have a CoTran senior citizen or disabled reduced fare identification card?

15% (3)  ( 1) Yes, senior citizen

35% (7)  ( 2) Yes, disabled

50% (10)  ( 3) Neither

2a. Which category best describes you?

10% (2)  ( 1) Full-time worker (outside the home)

0  ( 2) Part-time worker (outside the home)

0  ( 3) Work at home for wages

0  ( 4) Unemployed, looking for work

5% (1)  ( 5) Full-time rehabilitation

0  ( 6) Sheltered employment (full or part-time)

5% (1)  ( 7) Full-time student

0  ( 8) Full-time homemaker

25% (5)  ( 9) Retired

45% (9)  (10) Unemployed and on disability/public assistance/social security

10% (2)  (11) Other \_\_\_\_\_  
(specify)

b. If unemployed, do you think lift-bus service increases your chances of getting a job?

50% (5)  ( 1) Yes

50% (5)  ( 2) No, transportation is not the major problem

0  ( 3) No, I feel I could not use the service for travel to work.

3. What is your age?

5% (1)  ( 1) 10-19  ( 4) 55-64 15% (3)

25% (5)  ( 2) 20-34  ( 5) 65-74 15% (3)

25% (5)  ( 3) 35-54  ( 6) 75 and over 15% (3)

4. Are you....?

- 60% (12)  ( 1) Male  
40% (8)  ( 2) Female

5. Where do you reside?

Indicate your town (city): \_\_\_\_\_  
and zip code: \_ \_ \_ \_ \_

6a. Do you live in: (choose one answer)

- 65% (13)  ( 1) Single family house or duplex  
20% (4)  ( 2) Multifamily dwelling (apartment house or condominium)  
0  ( 3) Retirement complex  
5% (1)  ( 4) Group home for the handicapped  
0  ( 5) Nursing home  
0  ( 6) Other institution  
10% (2)  ( 7) Other \_\_\_\_\_  
(specify)

b. If you answered (1), (2), (3) or (4) please indicate how many people are members of your household?

Avg.=2.4

7. Do you use the services of any particular agency? (check all that apply)

- 33% (6)  ( 1) None  
6% (1)  ( 2) American Red Cross  
0  ( 3) Association for Retarded Citizens  
11% (2)  ( 4) Crippled Children's Society  
17% (3)  ( 5) Florida Department of Health and Rehabilitative Services  
0  ( 6) Gulfstream Goodwill  
0  ( 7) Jewish Community Center  
6% (1)  ( 8) Muscular Dystrophy Association  
0  ( 9) Operation Concern  
0  (10) Palm Beach County Department of Human Resources  
6% (1)  (11) Palm Beach Habilitation Center  
6% (1)  (12) Palm Beach Regional Visiting Nurses  
17% (3)  (13) South County Neighborhood Center  
11% (2)  (14) Veterans Administration Outpatient Clinic  
17% (3)  (15) Other \_\_\_\_\_  
(specify)

8. What is your gross annual household income?

- 28% (5)  ( 1) Under \$5,000  
28% (5)  ( 2) \$ 5,000 - \$ 9,999  
39% (7)  ( 3) \$10,000 - \$19,999  
0  ( 4) \$20,000 - \$29,999  
6% (1)  ( 5) \$30,000 - \$39,999  
0  ( 6) \$40,000 - \$49,999  
0  ( 7) \$50,000 or over

We welcome any other comments you may have concerning this new accessible service. YOUR TIME AND ASSISTANCE HAVE BEEN MOST APPRECIATED.

Appendix E  
SURVEY OF DISABLED NON-USERS





A. INFORMATION ABOUT YOUR DISABILITY AND/OR HANDICAP

1. What are your disabilities? (please check all that apply):

5% (3)	<input type="checkbox"/> ( 1) Cerebral palsy	<input type="checkbox"/> (12) Deafness/hearing impairment	0
3% (2)	<input type="checkbox"/> ( 2) Muscular dystrophy		
17% (10)	<input type="checkbox"/> ( 3) Multiple sclerosis	<input type="checkbox"/> (13) Speech impairment	3% (2)
10% (6)	<input type="checkbox"/> ( 4) Arthritis	<input type="checkbox"/> (14) Spina bifida	2% (1)
0	<input type="checkbox"/> ( 5) Epilepsy	<input type="checkbox"/> (15) Orthopedic (bone or joint) impairment	3% (2)
10% (6)	<input type="checkbox"/> ( 6) Polio		
0	<input type="checkbox"/> ( 7) Mental retardation	<input type="checkbox"/> (16) Paraplegic	17% (10)
5% (3)	<input type="checkbox"/> ( 8) Stroke	<input type="checkbox"/> (17) Quadriplegic	20% (12)
5% (3)	<input type="checkbox"/> ( 9) Heart impairment	<input type="checkbox"/> (18) Hemaplegic	0
0	<input type="checkbox"/> (10) Lung impairment	<input type="checkbox"/> (19) Amputee	3% (2)
7% (4)	<input type="checkbox"/> (11) Blindness/visual impairment	<input type="checkbox"/> (20) Temporary injury	0
		<input type="checkbox"/> (21) Other _____	24% (14)
		(specify)	

2. Which of the following difficulties or handicaps do you experience when travelling? (please check all that apply):

87% (52)	<input type="checkbox"/> ( 1) Difficulty climbing stairs
77% (46)	<input type="checkbox"/> ( 2) Difficulty walking
63% (38)	<input type="checkbox"/> ( 3) Difficulty maneuvering through crowds
57% (34)	<input type="checkbox"/> ( 4) Difficulty waiting outside for buses
73% (44)	<input type="checkbox"/> ( 5) Difficulty standing in moving vehicles
58% (35)	<input type="checkbox"/> ( 6) Difficulty maintaining balance while bus stops and starts
38% (23)	<input type="checkbox"/> ( 7) Unable to grasp/hold handrails on a bus
30% (18)	<input type="checkbox"/> ( 8) Unable to manipulate coins, tickets, etc.
7% (4)	<input type="checkbox"/> ( 9) Visual difficulty
2% (1)	<input type="checkbox"/> (10) Communication difficulty
12% (7)	<input type="checkbox"/> (11) Difficulty in understanding the bus system

3. Do curbs or other obstacles pose a potential barrier to your getting around outside? Please indicate how much of a problem the following are/would be by checking the appropriate boxes:

		(1) <u>Serious</u> <u>Problem</u>	(2) <u>Slight</u> <u>Problem</u>	(3) <u>No</u> <u>Problem</u>
a. curbs	73% (44)	<input type="checkbox"/>	18% (11) <input type="checkbox"/>	8% (5) <input type="checkbox"/>
b. inclines	41% (24)	<input type="checkbox"/>	32% (19) <input type="checkbox"/>	27% (16) <input type="checkbox"/>
c. rough street surface/ lack of sidewalks	62% (36)	<input type="checkbox"/>	31% (18) <input type="checkbox"/>	7% (4) <input type="checkbox"/>
d. crossing major streets	61% (35)	<input type="checkbox"/>	26% (15) <input type="checkbox"/>	11% (6) <input type="checkbox"/>
e. other _____ (specify)	43% (3)	<input type="checkbox"/>	43% (3) <input type="checkbox"/>	14% (1) <input type="checkbox"/>

4. What aids do you use when travelling outside of the house?

- 82% (49)  ( 1) Wheelchair
- 10% (6)  ( 2) Walker
- 12% (7)  ( 3) Walking Cane
- 7% (4)  ( 4) Crutches
- 5% (3)  ( 5) Braces
- 2% (1)  ( 6) Artificial limb
- 0  ( 7) Guide dog
- 0  ( 8) White cane
- 12% (7)  ( 9) Another person (escort)
- 13% (8)  (10) Special controls on my automobile
- 30% (18)  (11) My own lift-equipped van
- 5% (3)  (12) Other \_\_\_\_\_  
(specify)
- 2% (1)  (13) None

For Wheelchair Users (only):

5. Do you always use a wheelchair when outside of the house?

( 1) Yes 88% (43)

( 2) No 12% (6)

6. What type of wheelchair do you use?

( 1) Manual - narrow 4% (2)

( 2) Manual - standard 45% (22)

( 3) Manual - wide 2% (1)

( 4) Manual - junior 4% (2)

( 5) Power drive - conventional (E&J) 29% (14)

( 6) Power drive - Amigo 4% (2)

( 7) Power drive - Abec 0

( 8) Power drive - other 2% (1)

( 9) Both power and manual 10% (5)

Please Continue

B. TRANSPORTATION

1. Do you have a driver's license?

50% (30)  ( 1) Yes

50% (30)  ( 2) No

2. Do you (or does someone in your household) own a car or van?

53% (31)  ( 1) Yes, I have a car/van

34% (20)  ( 2) Other member of household has a car/van

14% (8)  ( 3) No

3. Other than CoTran bus service, what means of travel are frequently available to you? (Check all that apply)

42% (25)  ( 1) Drive

63% (38)  ( 2) Obtain a ride from a member of my household

38% (23)  ( 3) Obtain a ride from a friend

3% (2)  ( 4) Human (social) service agency transportation

18% (11)  ( 5) Taxi

5% (3)  ( 6) Private wheelchair-van service (Medicar)

12% (7)  ( 7) Other \_\_\_\_\_  
(specify)

3% (2)  ( 8) None

4. If each of the following were available, which would you be physically able to use? (Check all that apply)

45% (26)  ( 1) Drive

79% (46)  ( 2) Obtain a ride from a member of my household

64% (37)  ( 3) Obtain a ride from a friend

47% (27)  ( 4) Human (social) service agency transportation

43% (25)  ( 5) Taxi

57% (33)  ( 6) Private wheelchair-van service (Medicar)

52% (30)  ( 7) Door-to-door transit service (Dial-a-Ride)

16% (9)  ( 8) Other \_\_\_\_\_  
(specify)

2% (1)  ( 9) None

5. Please indicate HOW MANY one-way\* trips you made last week for each purpose by each of the following means:

\* Note that going somewhere is one trip. Returning is a second trip.

Means

<u>Purpose</u>	Walk/Wheel	Drive	Obtain a Ride From a Household Member	Human Service Agency Transportation	Taxi	CoTran Bus	Private Wheelchair Van Service (Medicar)	Other (specify below)	Means By Trip Purpose
a. Work	0	1.58	0	0	0	0	0	0	1.58
b. School	0	.33	.03	0	0	0	0	.23	.53
c. Shopping	.73	1.43	1.25	0	0	0	0	.12	3.53
d. Medical	.13	.47	.57	0	.02	0	.08	.03	1.30
e. Religious	.07	.40	.57	0	0	0	0	.03	1.07
f. Meals	.07	1.22	.43	0	0	0	0	.17	1.88
g. Social/ Recreational	.10	1.37	.62	0	0	0	0	.08	2.17
h. Personal Business/Other	.20	.83	.4	0	.03	0	0	.10	1.57

GRAND  
MEAN 13.63

6a. How far is the nearest bus stop from your home?

- 7% (4)  ( 1) Less than 1 block
- 3% (2)  ( 2) 1 block
- 13% (8)  ( 3) 2 blocks
- 10% (6)  ( 4) 3 blocks
- 35% (21)  ( 5) 4 or more blocks
- 32% (19)  ( 6) Not sure

b. What is the route number which serves this bus stop? (If you don't know, place zeros in spaces provided.)

Don't Know

92% (106)

Route \_\_\_\_\_ Route \_\_\_\_\_

c. How often are the buses scheduled to operate on this route during commuting hours?

- 8% (5)  ( 1) More than one hour apart
- 7% (4)  ( 2) Every hour
- 0  ( 3) Every half-hour
- 2% (1)  ( 4) Every 20 minutes
- 0  ( 5) Every 10 minutes or less
- 83% (50)  ( 6) Not sure

7. How far would you be willing to walk/wheel to a bus stop:

a. In good weather?

- 27% (16)  ( 1) Less than 1 block
- 10% (6)  ( 2) 1 block
- 18% (11)  ( 3) 2 blocks
- 12% (7)  ( 4) 3 blocks
- 33% (20)  ( 5) 4 or more blocks

b. In rainy weather?

- 5% (3)  ( 1) Less than 1 block
- 3% (2)  ( 2) 1 block
- 2% (1)  ( 3) 2 blocks
- 0  ( 4) 3 blocks
- 7% (4)  ( 5) 4 or more blocks
- 83% (50)  ( 6) Would not travel

8. Would you need personal assistance from an escort:

a. To get to the bus stop?

- 41% (24)  ( 1) Yes \_\_\_\_\_  
(explain)  
54% (32)  ( 2) No  
5% (3)  ( 3) Not sure

b. To travel on the lift bus?

- 33% (19)  ( 1) Yes \_\_\_\_\_  
(explain)  
61% (35)  ( 2) No  
5% (3)  ( 3) Not sure

c. To travel by taxi?

- 57% (30)  ( 1) Yes \_\_\_\_\_  
(explain)  
43% (23)  ( 2) No  
0  ( 3) Not sure

d. To travel by human (social) service agency or private wheelchair-van transportation (Medicar)?

- 25% (13)  ( 1) Yes \_\_\_\_\_  
(explain)  
70% (37)  ( 2) No  
6% (3)  ( 3) Not sure

9. Are you unable to travel due to a lack of transportation, for any of the following types of trips?

a. Work/school trips?

- 4% (2)  ( 1) Often  
13% (6)  ( 2) Sometimes  
83% (39)  ( 3) Never  
0  ( 4) Not sure

b. Shopping trips?

- 9% (5)  ( 1) Often  
33% (19)  ( 2) Sometimes  
59% (34)  ( 3) Never  
0  ( 4) Not sure

c. Medical trips?

- 7% (4)  ( 1) Often  
24% (14)  ( 2) Sometimes  
70% (41)  ( 3) Never  
0  ( 4) Not sure

d. Other trips?

- 9% (5)  ( 1) Often  
33% (19)  ( 2) Sometimes  
58% (33)  ( 3) Never  
0  ( 4) Not sure

10. Would you use lift-equipped buses, if there were bus stops conveniently located near your home and near your destination, for the following types of trips?

a. Work/school trips?

- 17% (9)  ( 1) Often  
28% (15)  ( 2) Sometimes  
53% (28)  ( 3) Never  
2% (1)  ( 4) Not sure

b. Shopping trips?

- 27% (15)  ( 1) Often  
52% (29)  ( 2) Sometimes  
16% (9)  ( 3) Never  
5% (3)  ( 4) Not sure

c. Medical trips?

- 21% (12)  ( 1) Often  
41% (23)  ( 2) Sometimes  
32% (18)  ( 3) Never  
5% (3)  ( 4) Not sure

d. Other trips?

- 22% (12)  ( 1) Often  
61% (33)  ( 2) Sometimes  
13% (7)  ( 3) Never  
4% (2)  ( 4) Not sure

11. Before participating in this survey, were you aware of CoTran's lift-equipped bus service?

- 88% (53)  ( 1) Yes  
12% (7)  ( 2) No -- (Skip to Section C, page 11)

12. How did you first learn about CoTran's lift-equipped buses? (Please check all that apply)

- 6% (3)  ( 1) Radio  
48% (25)  ( 2) TV  
42% (22)  ( 3) Newspaper/magazine  
4% (2)  ( 4) Saw CoTran demonstrating the operation of the lift  
8% (4)  ( 5) Human (social) service agency  
23% (12)  ( 6) Word of mouth  
2% (1)  ( 7) Saw someone using the lift in service  
2% (1)  ( 8) Health care worker/therapist/counselor  
0  ( 9) Realized bus you were about to board had lift mechanism  
19% (10)  (10) Other \_\_\_\_\_  
(specify)

13a. Did you participate in a demonstration or receive training in how to use the lift?

- 14% (7)  ( 1) Yes  
86% (43)  ( 2) No -- (Skip to Section C, page 11)

b. From whom did you receive training?

- 0  ( 1) Human (social) service agency  
0  ( 2) Rehabilitation professional (therapist, nurse, counselor)  
29% (2)  ( 3) CoTran (at a special demonstration of the lift)  
71% (5)  ( 4) Other \_\_\_\_\_  
(specify)

Please Continue





6. What would most influence you to try the lift-bus?

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Please Continue

D. GENERAL CHARACTERISTICS

(This information is for statistical purposes only.)

1. Do you have a CoTran senior citizen or disabled reduced fare identification card?

2% (1)  ( 1) Yes, senior citizen

9% (5)  ( 2) Yes, disabled

90% (53)  ( 3) Neither

2a. Which category best describes you?

17% (10)  ( 1) Full-time worker (outside the home)

5% (3)  ( 2) Part-time worker (outside the home)

0  ( 3) Work at home for wages

0  ( 4) Unemployed, looking for work

2% (1)  ( 5) Full-time rehabilitation

0  ( 6) Sheltered employment (full or part-time)

7% (4)  ( 7) Full-time student

2% (1)  ( 8) Full-time homemaker

34% (20)  ( 9) Retired

31% (18)  (10) Unemployed and on disability/public assistance/social security

3% (2)  (11) Other \_\_\_\_\_  
(specify)

b. If unemployed, do you think lift-bus service increases your chances of getting a job?

24% (6)  ( 1) Yes

76% (19)  ( 2) No, transportation is not the major problem

0  ( 3) No, I feel I could not use the lift bus service for travel to work.

3. What is your age?

3% (2)  ( 1) 10-19      30% (18)  ( 4) 55-64

15% (9)  ( 2) 20-34      7% (4)  ( 5) 65-74

37% (22)  ( 3) 35-54      8% (5)  ( 6) 75 and over

4. Are you....?

62% (37)  ( 1) Male

38% (23)  ( 2) Female

5. Where do you reside?

Indicate your town (city): \_\_\_\_\_

and zip code: \_ \_ \_ \_ \_

6a. Do you live in: (choose one answer)

- 73% (41)  ( 1) Single family house or duplex  
23% (13)  ( 2) Multifamily dwelling (apartment house or condominium)  
0  ( 3) Retirement complex  
0  ( 4) Group home for the handicapped  
0  ( 5) Nursing home  
0  ( 6) Other institution  
2% (1)  ( 7) Other \_\_\_\_\_  
(specify)

b. If you answered (1), (2), (3) or (4) please indicate how many people are members of your household?

Avg. = 2.4 (52)

7. Do you use the services of any particular agency? (check all that apply)

- 32% (19)  ( 1) None  
3% (2)  ( 2) American Red Cross  
0  ( 3) Association for Retarded Citizens  
32% (19)  ( 4) Crippled Children's Society  
3% (2)  ( 5) Florida Department of Health and Rehabilitative Services  
0  ( 6) Gulfstream Goodwill  
2% (1)  ( 7) Jewish Community Center  
2% (1)  ( 8) Muscular Dystrophy Association  
0  ( 9) Operation Concern  
2% (1)  (10) Palm Beach County Department of Human Resources  
3% (2)  (11) Palm Beach Habilitation Center  
10% (6)  (12) Palm Beach Regional Visiting Nurses  
0  (13) South County Neighborhood Center  
37% (22)  (14) Veterans Administration Outpatient Clinic  
20% (12)  (15) Other \_\_\_\_\_  
(specify)

8. What is your gross annual household income?

- 19% (8)     ( 1)    Under \$5,000
- 26% (11)    ( 2)    \$ 5,000 - \$ 9,999
- 17% (7)     ( 3)    \$10,000 - \$19,999
- 17% (7)     ( 4)    \$20,000 - \$29,999
- 14% (6)     ( 5)    \$30,000 - \$39,999
- 5% (2)     ( 6)    \$40,000 - \$49,999
- 2% (1)     ( 7)    \$50,000 or over

We welcome any other comments you may have concerning this new accessible service. YOUR TIME AND ASSISTANCE HAVE BEEN MOST APPRECIATED.

Appendix F  
ON-BOARD SURVEY  
OF  
ABLE-BODIED BUS RIDERS





6. How many of these trips each week are for work or school? (19-20)

Average 4.4 one-way trips (If none, please mark a zero)  
(30% made none)

7. How far did you have to walk to board this bus? (21-22)

Average 2.2 blocks (If less than one block, please mark a zero)  
27% less than one block  
20% one block  
23% two blocks  
16% three blocks  
16% four+ blocks

THE FOLLOWING QUESTIONS ARE NECESSARY FOR STATISTICAL PURPOSES. YOUR ANSWERS WILL MAKE THIS SURVEY MORE USEFUL.

8. What is your age? (23)

0%  (1) under 10                      30%  (5) 55-64  
10%  (2) 10-19                        17%  (6) 65-74  
19%  (3) 20-34                        2%  (7) 75 or over  
23%  (4) 35-54

9. Are you . . . ? (24)

30%  (1) Male                      70%  (2) Female

10. Are you or is any other member of your family, mobility-impaired? (25-26)

3%  (1) I am, \_\_\_\_\_  
(Specify impairment)

2%  (2) Other family member is, \_\_\_\_\_  
(Specify impairment)

94%  (3) No

11. Do you have a driver's license? (27)

34%  (1) Yes                        66%  (2) No

12. How many autos are owned or operated by your household? (28)

33%  (1) One                        4%  (3) Three or more  
10%  (2) Two                        54%  (4) None

13. What is your gross annual household income? (29)

18%  (1) Under \$5,000            4%  (5) \$30,000 - \$39,999  
43%  (2) \$ 5,000 - \$ 9,999    1%  (6) \$40,000 - \$49,999  
27%  (3) \$10,000 - \$19,999    0%  (7) \$50,000 or over  
7%  (4) \$20,000 - \$29,999

Thank you for your time and assistance. We welcome any other comments you may have about the lift-equipped bus service: (30-31)

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Appendix G  
DRIVER SURVEYS





Palm Beach County Accessible Bus Demonstration  
DRIVER SURVEY

As you know, CoTran has specially equipped all of its transit buses with lifts at the front door so that wheelchair users and other passengers who have difficulty climbing stairs can use regular route lift bus service. This survey is being conducted by CoTran, in cooperation with the Federal Department of Transportation. The federal government will use the results of this survey to evaluate how successful lift-equipped buses are in providing transportation to disabled residents.

Please help us improve transportation for everyone by completing this survey. Your cooperation is most appreciated.

Do Not Write  
In This Space

I.D. \_\_\_\_\_  
1-5

1. \_\_\_\_\_  
6

2. \_\_\_\_\_  
7-12

Percent (No. Respondents)

1. Have you experienced difficulty operating the lift?

- 71% (83)  (1) A few times
- 4% (5)  (2) 50% of the times
- 4% (5)  (3) 75% of the times
- 0  (4) Every time
- 12% (14)  (5) Never deployed the lift
- 9% (10)  (6) No

2. What are the most frequent problems you have experienced with the lift? (Please choose all that apply.)

- 46% (51)  (1) Lift fails to operate
- 67% (75)  (2) Lift platform drifts out of position
- 10% (11)  (3) Fails to stow properly
- 21% (24)  (4) Fails to lower/rise
- 3% (3)  (5) Safety interlock prevents the bus from operating
- 5% (6)  (6) Other \_\_\_\_\_
- 4% (5)  (7) None (specify)

3. Do you feel the lift equipment is basically reliable?

- 59% (68)  (1) Yes                      20% (23)  (3) Not sure  
21% (24)  (2) No

4. How often have you operated the lift for passengers since the lifts were installed on the CoTran buses?

- 10% (12)  (1) Once                      10% (11)  (5) Five times  
10% (11)  (2) Twice                      29% (33)  (6) Six or more times  
7% (8)  (3) Three times                      25% (29)  (7) Never -- (skip to  
10% (11)  (4) Four times                      Question 15)

5. Has operation of the lift caused an increase in your workload?

- 30% (26)  (1) Yes                      6% (5)  (3) Not sure  
64% (56)  (2) No

6. Have you had to leave your seat to assist lift users either getting on/off the lift, or securing them into their seat position?

- 46% (40)  (1) Yes, frequently  
22% (19)  (2) Occasionally  
17% (15)  (3) Rarely, if ever  
15% (13)  (4) Never -- (skip to Question 8)

7. Has this generally occurred at the user's request or your own initiative?

- 20% (14)  (1) User's requests  
48% (34)  (2) Own initiative  
32% (23)  (3) Both

8. How have non-handicapped riders generally responded to the use of the lift? (Please choose all that apply.)

- 17% (16)  (1) Offered assistance                       (5) Some impatience                      12% (11)  
47% (43)  (2) Favorably                       (6) Negative comments                      9% (8)  
35% (32)  (3) Curiosity                       (7) Ridicule                      3% (3)  
11% (10)  (4) No reaction                       (8) Too variable to generalize                      2% (2)

3. \_\_\_\_\_  
13

4. \_\_\_\_\_  
14

5. \_\_\_\_\_  
15

6. \_\_\_\_\_  
16

7. \_\_\_\_\_  
17

8. \_\_\_\_\_  
18-21

9.	How have lift users handled such reactions? (Please choose all that apply.)	9.	_____
			22-24
73% (63)	<input type="checkbox"/> (1) No reaction		
4% (3)	<input type="checkbox"/> (2) Embarrassed		
15% (13)	<input type="checkbox"/> (3) Apologetic		
4% (3)	<input type="checkbox"/> (4) With angry response		
7% (6)	<input type="checkbox"/> (5) Too varied to generalize		
1% (1)	(6) Good Reaction		
10.	How valuable was the handicap awareness training you received?	10.	_____
			25
65% (53)	<input type="checkbox"/> (1) Very Valuable	<input type="checkbox"/> (3) Not Valuable	4% (3)
28% (23)	<input type="checkbox"/> (2) Somewhat Valuable	<input type="checkbox"/> (4) Did not receive training	4% (3)
11.	How valuable was the lift operation training you received?	11.	_____
			26
74% (61)	<input type="checkbox"/> (1) Very Valuable	<input type="checkbox"/> (3) Not Valuable	5% (4)
21% (17)	<input type="checkbox"/> (2) Somewhat Valuable	<input type="checkbox"/> (4) Did not receive training	1% (1)
12.	Do you feel you need refresher training?	12.	_____
			27
5% (4)	<input type="checkbox"/> (1) Yes, in lift operation	<input type="checkbox"/> (3) Yes, in both	0
2% (2)	<input type="checkbox"/> (2) Yes, in handicap awareness	<input type="checkbox"/> (4) No	93% (77)
13.	What problems arose that were not covered in the training session?	13.	_____
			28
	None 50% (44)	Didn't answer question 41% (36)	
	Some 10% (4)		
14.	Have problems with the lift equipment affected the overall service reliability?	14.	_____
			29
12% (10)	<input type="checkbox"/> (1) Considerably	<input type="checkbox"/> (3) No	46% (38)
31% (25)	<input type="checkbox"/> (2) Only slightly	<input type="checkbox"/> (4) Not sure	11% (9)

15. Do you feel the bus company image has improved as a result of the lift bus project?

44% (48)

(1) Yes

23% (25)

(3) Not sure

34% (37)

(2) No

16. Do you support the lift bus project effort to serve the handicapped?

70% (78)

(1) Yes

11% (12)

(3) Not sure

20% (22)

(2) No

Other Comments:

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---

---

---

---

---

15. \_\_\_\_\_

30

16. \_\_\_\_\_

31

17. \_\_\_\_\_

32

Thank you!

CoTran BUS OPERATOR SURVEY

This is the second survey of bus operators to be conducted in conjunction with the accessible bus demonstration project. The first survey you may recall was conducted in September. We hope to learn whether conditions and opinions have changed over the past six months. Please complete this survey and return it to the supervisor. It is not necessary to sign your name on the form; we prefer that the survey be anonymous. Thank you.

Percent (No. Respondents)

1. Have you experienced difficulty operating the lift (either in service or at the garage)?

- 34% (42)  (1) Never experienced any difficulties (Skip to Question 4)
- 52% (63)  (2) A few times
- 3% (4)  (3) 25% of the time
- 2% (2)  (4) 50% of the time
- 3% (4)  (5) 75% of the time
- 5% (6)  (6) Almost every time
- 1% (1)  (7) Never operated the lift (Skip to Question 14)

2. What is the most frequent problem you are currently experiencing with the lift? (Please choose one answer.)

- 13% (10)  (1) Fails to move from the stowed position
- 25% (20)  (2) Fails to lower/rise
- 5% (4)  (3) Safety gate fails to operate properly
- 4% (3)  (4) Fails to stop when touches ground
- 1% (1)  (5) Fails to stow properly
- 44% (35)  (6) Drifts out of stowed position
- 3% (1)  (7) Safety interlock malfunctions; bus cannot be moved
- 0  (8) Controls are confusing
- 6% (5)  (9) Other \_\_\_\_\_  
(specify)

3. Have problems with the lift equipment affected the overall service reliability?

- 6% (5)  (1) Considerably  (3) No 52% (41)
- 35% (28)  (2) Only slightly  (4) Not sure 6% (5)

DO NOT WRITE IN THIS SPACE

I.D. \_\_\_\_\_  
1. 6

2. \_\_\_\_\_

3. 3

PLEASE CONTINUE ON THE NEXT PAGE

4. Do you feel the lift equipment is basically reliable?

77% (91)  (1) Yes                      12% (14)  (3) Not sure

12% (14)  (2) No

4.             
9

5. During the past four weeks, how often have you started your run assignment with an inoperable lift?

        Avg.=.5         times

5.         10-11        

6. Please estimate the number of times you have operated the lift to board a passenger in the past four weeks?

        Avg.=2.1         times

6.         12-14        

7. During the past four weeks, how many times have you had to deny the use of the lift for any reason? Please list those reasons.

        Avg.=.2         times

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

7.         15-16        

8. Have you had to leave your seat to assist lift users getting on/off the lift?

40% (48)  (1) No

35% (42)  (2) Yes, a few times

4% (5)  (3) Yes, 25% of the time

2% (2)  (4) Yes, 50% of the time

4% (5)  (5) Yes, 75% of the time

16% (19)  (6) Almost every time

8.                           
17

9. Have you had to leave your seat to assist lift users to secure them into their seat position?

33% (40)  (1) No

36% (43)  (2) Yes, a few times

2% (2)  (3) Yes, 25% of the time

2% (2)  (4) Yes, 50% of the time

3% (4)  (5) Yes, 75% of the time

25% (30)  (6) Almost every time

9.                           
18

PLEASE CONTINUE ON NEXT PAGE

10. Has this assistance generally been at the user's request or your own initiative?

10a. 19

a. Getting on/off the lift

20% (20)  (1) User's requests  (3) Both 35% (35)

46% (46)  (2) Own initiative

b. Securing passengers in position:

10b. 20

11% (10)  (1) User's requests  (3) Both 27% (25)

63% (59)  (2) Own initiative

11. 21

11. How have non-handicapped riders responded to the use of the lift? (Please choose all that apply.)

25% (30)  (1) No reaction 11% (13)  (5) Some impatience

36% (43)  (2) Curiosity 7% (8)  (6) Negative comments

56% (66)  (3) Favorably 3% (3)  (7) Ridicule

22% (26)  (4) Offered assistance

23

24

25

12. If you observed unfavorable reactions above, how have lift users handled such reactions? (Please choose all that apply.)

26

27

12. 28

3% (3)  (1) Embarrassed

10% (10)  (2) Apologetic

11% (11)  (3) With angry response

86% (88)  (4) No reaction

29

30

31

13. What problems have arisen during service operation that were not covered in the training session?

---

---

14. Do you feel you need refresher training in how to operate the lift or in dealing with handicapped persons?

14. 32

0  (1) Yes, in lift operation  (3) Yes, in both

3% (4)  (2) Yes, in handicap awareness  (4) No 97% (118)

PLEASE CONTINUE ON THE NEXT PAGE

15. Do you think CoTran's image has changed as a result of the lift bus project? (Please indicate how.)

15.             
33

46% (55)  (1) Improved            21% (25)  (3) Remained the same  
4% (5)  (2) Deteriorated    30% (36)  (4) Don't know

16. Do you support the lift bus project effort to serve the handicapped?

16.             
34

80% (97)  (1) Yes                    7% (9)  (3) Not sure  
13% (16)  (2) No

17. How long have you been a CoTran bus driver?

17.             
35-36

Avq.=3.9    Years            5.7    Months

37-38

Other Comments:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Thank you!

Appendix H  
RESIDENT SURVEY



COTRAN TRAVEL SURVEY OF COUNTY RESIDENTS

1. Do you have a driver's license?

81%  ( 1) Yes

19%  ( 2) No

2. How many motor vehicles are operated by your household?

2% zero

58% one Cars/vans \_\_\_\_\_ Other vehicles

40% two+

3a. Have you ever used CoTran (the county bus service)?

43%  ( 1) Yes

57%  ( 2) No

b. What is your overall opinion of the quality of the CoTran bus service?

23%  ( 1) Very good

49%  ( 2) Good

22%  ( 3) Fair

4%  ( 4) Poor

2%  ( 5) Very poor

4a. How far is the nearest bus stop from your home?

11%  ( 1) 0 blocks

25%  ( 2) 1 block

18%  ( 3) 2 blocks

11%  ( 4) 3 blocks

17%  ( 5) 4 or more blocks

19%  ( 6) Not sure

b. What is the route number which serves this bus stop? (If you don't know, place zeros in spaces provided.)

Route 1 23%

Route 4 21%

Don't Know 89%

c. How often are the buses scheduled to operate on this route during commuting hours?

2%  ( 1) More than one hour apart

14%  ( 2) Every hour

15%  ( 3) Every half-hour

8%  ( 4) Every 20 minutes

0%  ( 5) Every 10 minutes or less

60%  ( 6) Not sure

5. Please indicate HOW MANY one-way\* trips you made last week for each purpose by each of the following means:

\* Note that going somewhere is one trip. Returning is a second trip.

Means

<u>Purpose</u>	Walk	Drive	Obtain a Ride From a Household Member	Obtain a Ride From a Friend	CoTran Bus	Taxi	Human Service Agency Transportation	Other (specify below)
a. Work								
b. School								
c. Shopping								
d. Medical								
e. Religious								
f. Meals								
g. Social/ Recreational								
h. Personal Business/Other								

6. Do you have a CoTran senior citizen or disabled reduced fare identification card?

24%  ( 1) Yes

76%  ( 2) No

7a. Do you have a disability or handicap which makes travelling difficult?

14%  ( 1) No -- (Skip to Question 8)

86%  ( 2) Yes

b. What are those specific handicaps (please check all that apply):

47%  ( 1) Difficulty climbing stairs

7%  ( 2) Need wheelchair when travelling outside the house

20%  ( 3) Difficulty maneuvering through crowds

34%  ( 4) Difficulty waiting outside for buses

41%  ( 5) Difficulty standing in moving vehicles

30%  ( 6) Difficulty maintaining balance while bus stops and starts

8%  ( 7) Unable to reach or hold grips

51%  ( 8) Difficulty walking

9%  ( 9) Communication difficulty

21%  (10) Visual difficulty

25%  (11) Difficulty in understanding the bus system

c. If you answered (1) or (2), have you or do you plan to use the new lift device designed for easier boarding of CoTran buses?

5%  ( 1) I have used it

21%  ( 2) I plan to try it

22%  ( 3) I have no plans to use it

52%  ( 4) I have no need for it

8. Would you be willing to fill out a brief 2-week travel diary to be used in our study? (You would receive from CoTran a cash payment of \$10 to complete the diary.)

33%  ( 1) Yes -- list phone number: \_\_\_\_\_  
and first name: \_\_\_\_\_

67%  ( 2) No

THE FOLLOWING INFORMATION IS FOR STATISTICAL INFORMATION ONLY:

9. What is your age? 47% 65 and over
10. Are you....?
- 39%  ( 1) Male  
61%  ( 2) Female
11. Which category best describes you?
- 33%  ( 1) Full-time worker (outside the home)  
7%  ( 2) Part-time worker (outside the home)  
1%  ( 3) Work at home for wages  
1%  ( 4) Unemployed, looking for work  
1%  ( 5) Full-time student  
8%  ( 6) Full-time homemaker  
43%  ( 7) Retired  
3%  ( 8) Unemployed and on disability/public assistance/social security  
2%  ( 9) Other \_\_\_\_\_  
(specify)
12. Where do you reside?
- Indicate your town (city): 68% West Palm Beach; 31% Lake  
and zip code: \_\_\_\_\_ 1% other Worth
13. How many people live in your household year round? (including yourself) 24% live alone
14. What is your gross annual household income?
- 18%  ( 1) Under \$5,000  
20%  ( 2) \$ 5,000 - \$ 9,999  
28%  ( 3) \$10,000 - \$19,999  
17%  ( 4) \$20,000 - \$29,999  
9%  ( 5) \$30,000 - \$39,999  
4%  ( 6) \$40,000 - \$49,999  
4%  ( 7) \$50,000 or over

THANK YOU!

Appendix I  
TRAVEL DIARY



ID# \_\_\_\_\_

# Travel Diary

Thank you for assisting us by filling out this travel diary. The information you provide will help us to provide better bus service. YOU WILL FIND INSTRUCTIONS INSIDE THIS BOOKLET TO USE AS A GUIDE IN COMPLETING YOUR DIARY. An aide from the Survey Center will acquaint you with the rules for completing the diary, and will always be available by phone to help answer any questions. Your aide will be calling you from time to time to make sure that you are not encountering problems.

Your aide's name is: \_\_\_\_\_.

He/she can be contacted at: \_\_\_\_\_.

## INSTRUCTIONS FOR COMPLETING THE TRAVEL DIARY

This diary has been designed as a record of ALL TRIPS that you make. You should use it as a logbook to record the details of EACH TRIP which you make on EACH DAY of the two-week reporting period, including weekends. All TRIPS should be included, whether made by you alone or in the company of others, regardless of how far you traveled, for what purpose you traveled, or by what means you traveled. USE A SEPARATE LINE for EACH successive TRIP, a SEPARATE PAGE for EACH successive DAY. At the end of the two week reporting period, ENCLOSE the booklet in the self-addressed stamped envelope provided, and MAIL it back to the SURVEY CENTER at CoTran.

1. A TRIP is defined as a one-way journey for which you leave your house (or other starting location) to go to some other place for ANY PURPOSE by ANY MEANS of TRAVEL. Examples of typical TRIPS are:
  - a) A journey from your home to the place where you work.
  - b) A journey from the place where you work to your home.
  - c) A journey on foot from your home to visit a friend.

You should include any trip, large or small, for which you must go outdoors. HOWEVER, walking between different shops in a single shopping area (the mall, downtown street, etc.) does not count as a separate trip, nor does picking up a newspaper on the way to work. You should also remember that your trips must all "fit together," so that you do not appear to go some place and not come back.

2. Record ALL TRIPS made for EACH DAY in FULL DETAIL in the logbook. On each page of the booklet make sure to fill in the correct DATE

in the space provided in the upper left hand corner. If you make more than 5 trips on one particular day, continue to the next page, but remember to record the correct date.

3. For EACH TRIP, record the following information:

- a) WHERE DID YOU GO - describe the PLACE and its street LOCATION. For example: Home, Church, or Home of a Friend. If you have trouble remembering the exact address, the nearest intersection will do.
- b) TIME YOU LEFT - record the TIME your journey to this place BEGAN as accurately as you remember.
- c) TIME YOU ARRIVED - record the TIME you arrived at your destination.
- d) PURPOSE OF TRIP - every trip is made for some PURPOSE, even if it is just for recreation or to accompany someone else. Try to describe that reason as best you can. If more than one activity is engaged in at a given destination, list the most important reason for the trip. The following are typical trip purposes: WORK, EDUCATION/TRAINING, FOOD SHOPPING, OTHER SHOPPING, PERSONAL BUSINESS (banking, hairdresser, etc.), MEDICAL (including physical therapy, dentist, etc.), MEALS, ACCOMPANYING A FRIEND TO ASSIST THEM, . . . If none of the above purposes applies, explain the purpose in your own words. (Note that sheltered workshop is a work trip; vocational rehabilitation is an education/training trip.)

- e) MEANS OF TRAVEL - indicate the PRINCIPAL way in which you traveled on your trip. If you WALKED to the bus stop, and then took the BUS downtown, BUS would be your principal means of travel. If on a particular trip you traveled by more than one MEANS and are not sure which was the PRINCIPAL MEANS of TRAVEL, record EACH means. A trip in which you WALK is as important as one in which you DRIVE. If you travel some place in an automobile, be sure to indicate if you were the DRIVER or PASSENGER. Always record enough information so that you are sure your record shows what really happened.

If you used a COTRAN BUS during your trip:

- f) GETTING TO The BUS STOP - please indicate how you got to the bus stop. Also indicate if you needed the help of an escort to get to the bus stop by writing "WITH ESCORT." If you are a wheelchair user and you wheeled to the bus stop, indicate so by writing "WHEELED."
- g) TRANSFERS - indicate if you TRANSFERRED to another CoTran bus during your trip, by checking the appropriate box.
- h) USING THE LIFT -disabled passengers may use the new LIFT device on CoTran buses to get on and off the bus. If you used the lift, please indicate so by checking the box provided. If you encountered any DIFFICULTIES while using the lift, please EXPLAIN those problems briefly.

Date \_\_\_\_\_ Where did you start your first trip today? \_\_\_\_\_

(Name of place) \_\_\_\_\_ (Address) \_\_\_\_\_

Trip	And then where did you go?	At what time did you leave to go there?	At what time did you arrive there?	Purpose of trip	By what means did you travel?	How did you get to the bus stop?	If you used CoTran:	
							Did you transfer to another bus?	If you used the CoTran lift: Check the box below, and explain any difficulties you encountered
1	Place and Address: _____ _____ _____	: am : pm	: am : pm				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> used lift
2	Place and Address: _____ _____ _____	: am : pm	: am : pm				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> used lift
3	Place and Address: _____ _____ _____	: am : pm	: am : pm				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> used lift
4	Place and Address: _____ _____ _____	: am : pm	: am : pm				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> used lift
5	Place and Address: _____ _____ _____	: am : pm	: am : pm				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> used lift

IF YOU TOOK MORE THAN 5 TRIPS TODAY, CONTINUE ON THE NEXT PAGE  
REMEMBER TO RECORD THE DATE ON EACH PAGE

APPENDIX J

REPORT OF NEW TECHNOLOGY

A thorough review of the work performed under this contract has revealed no significant innovations, discoveries, or inventions at this time. In addition, all methodologies employed are available in the open literature. However, the findings in this document do represent new information and should prove useful throughout the United States in designing and evaluating future transportation demonstrations.

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